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THE FOUNDRY

Established in 1892 by John A. Penton

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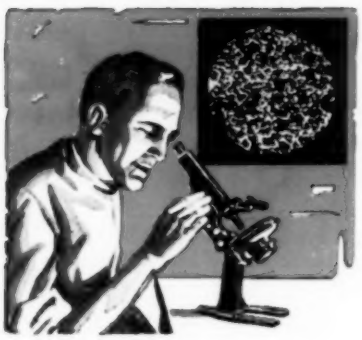


THE FOUNDRY for April

Shirt Tail BUYING

SOME months ago a buyer of castings was asked why he had placed an order with a foundryman about whose work he was complaining. Price, of course, was the answer. He mentioned a number of other firms, recognized for quality work, but frankly stated that those firms still expected to get a profit on their work. One or two shops were not so insistent, and in fact seemed to be willing to take the work at a loss. As he said, "If they want to give away their work and loose their shirts, why should we quibble." Of course, the buyer of the castings probably encountered a similar shirt acceptance by his customer. Remember the picnic game, played in the old days after the third keg was broached, when various hilarious ones were placed in a circle, provided with scissors and each was invited to cut a piece of the shirt tail of the man in front. The neck band was the limit. Aren't we cutting the neckband, right now?

Weight Is BASIC

RECENTLY, a group of foundrymen has made a study of the factor of error in estimating weights of castings from blueprints for cost finding purposes. A series of typical castings was chosen and the prints submitted to a number of recognized firms for weight estimates. The variation reported was as high as 180 per cent in a fractional pound casting and as much as 82 per cent in a casting weighing under two pounds. Obviously, the influence of this wide divergence upon the resultant cost estimates would be vital. The job of estimating weight from a blueprint is not easy. Training and knowledge of elementary mathematics are essential. Until such time as the universal practice of showing weights on blueprints is adopted, the investment in wages of a qualified estimator will be returned many times in the savings in prices quoted and in the ability to make the estimate show accurately the cost, plus a profit.

Saving by WRECKING

A STRONG lesson in vision and economy is furnished every resident of a larger city these days in the wrecking of downtown business buildings. The demolishing proceeds, even in serviceable structures when the return from rentals fails to keep pace with expenses. The multiplying of parking lots holds a lesson for industrial managers. The larger firms operating many units have proceeded to consolidate in the lower cost plants. The idle shops have been torn down, with a saving in taxes, insurance, watchman's hire and upkeep. The same principle can be applied to unused or uneconomical parts of existing plants. If the immediate future holds no promise of demanding the use of a part of a foundry, wreck it. If equipment, long since written off, is not likely to be in service soon, junk it. Unless a firm is not contemplating future operation, this equipment can better be junked than sold for second hand use. The difference in direct return between the scrap and the second hand price is more than compensated by the removal of this equipment from use by a possible cheaply equipped, price cutting competitor.

What's New In APRIL

GRAY iron jewelry shop is the term applied to a Michigan foundry. Products and practices are described by Fred Erb and Edwin Bremer (page 10). Of course, the American Foundrymen's association will have much to offer in the convention and exposition, June 20-23 and then there is the Century of Progress (page 13). Small orders and small furnaces fit together, and gray iron can be made in crucibles (page 16). They have a way in South Bend, at Studebaker's (page 17). Right down to date, forty years in THE FOUNDRY (page 22).

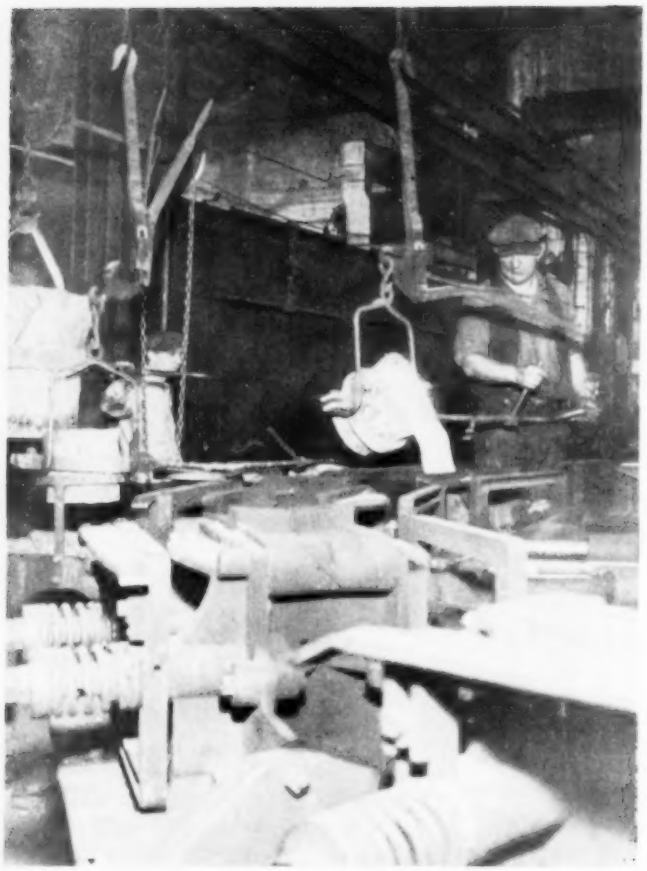


Fig. 1—Molds are poured from a small hand shank which in turn is filled from a bull ladle shown at the left

Gray Iron Cast to Engineering Specifications

By FRED ERB
and
EDWIN BREMER

IMPROVEMENTS which have been effected in the metallurgy of gray iron have raised the standards of the entire industry and caused a changed conception of that material for structural applications. Gray iron has become an important engineering material because of its vastly improved physical properties and because it is possible to control and reproduce these properties at will, thus enabling this new material to fill economically an important place in engineering design and service.

Therefore, the modern gray iron foundry must be prepared to meet definite physical specifications. Facilities must be available for accurately producing cast iron of any required composition, controlling the physical properties and thus meeting the increasingly rigid requirements being specified for many types of important iron castings.

Keep Abreast of Demands

To keep abreast of those advancing demands constant research and installation of modern equipment in the foundry are essential for the economical production of castings of highest quality for the variety of service requirements which must be met. And it is by following those principles that the Eaton-Erb Foundry Co., Vassar, Mich., a pioneer in the manufacture of electric furnace iron, has been able to accomplish some remarkable developments in the production of superior quality gray iron castings with high physical specifications.

The firm operates a production foundry specializing principally on automotive work and also engaged extensively in making refrigerator castings, glass molds and production machine parts as shown in Fig. 6. The foundry is advantageously located at Vassar. It is served by both the Pere Marquette and Michigan Central railroads and is within easy trucking distance of Detroit, Saginaw and Flint, to which points

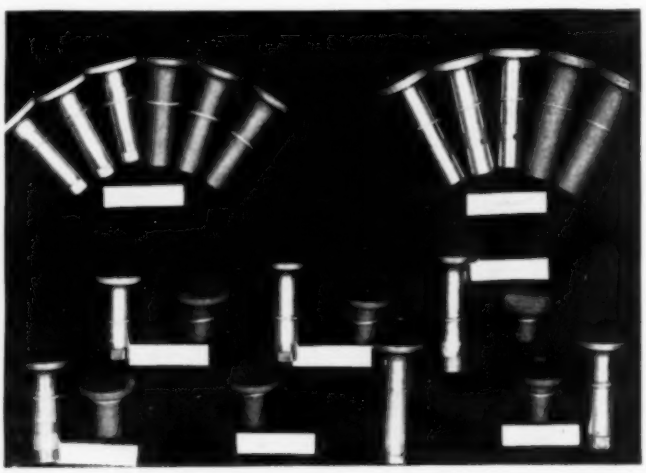


Fig. 2—Rough and finished tappets for various motor cars made from electric iron

complete shipping and service facilities are maintained.

In addition to sand casting facilities, the foundry contains a completely equipped permanent mold department. That department includes eight 12-head rotary casting machines, as well as a number of smaller casting machines. The permanent mold process is ideally adaptable to a large class of castings permitting substantial economies in comparison with the cost of producing castings possessing similar properties in sand. At the same time a high quality product is obtained with the dense fine-grained iron produced by this method.

Equipment also includes annealing ovens, as all permanent mold castings are annealed to provide definite machineability. The annealing operation is conducted in such a manner as to break down the massive cementite without sacrificing the high strength of the casting. The annealing cycle occupies about 3 hours from the time the castings enter the furnace until they are removed.

Have High Machining Speed

Through improved machineability of the casting, a higher machining speed is made possible, and in many cases machining operations are eliminated because the castings may be made to closer dimensions. Machining of permanent mold castings may be performed within narrower tolerances, especially where holes are held to close size. This is made possible because of the unusual density of grain structure and uniform hardness.

To meet present-day specifications the Eaton-Erb Co. has installed electric furnace equipment consisting of one 6000-pound and one 400-pound capacity furnaces of the indirect-arc, rocking type manufactured by the Detroit Electric Furnace Co., Detroit. These furnaces shown in Fig. 3, are used both for cold melting operations and for duplexing molten cupola iron. Decision as to

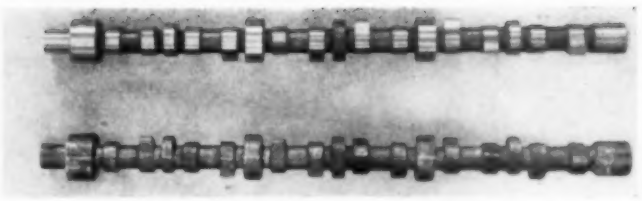


Fig. 4—Camshafts in the rough and finished states made from electric iron in permanent molds

melting from the cold or duplexing is dictated primarily by consideration of the tonnage required. Since it is possible to obtain three to four times the hourly productive capacity from the furnace when duplexing as compared with cold-melting, duplexing is followed at all times when production requirements permit.

Both plain and alloyed irons are made and, depending upon the nature of the castings to be made and the physical properties which they must possess, various types of materials are charged into the electric furnaces. Close melting control is maintained and the various ingredients of the charge are apportioned so as to secure, within extremely close limits, the composition required for maximum physical properties. This facility also enables the firm to produce the exact iron best suited to the casting in question and to reproduce that material dependably.

The first unit to be installed was the 6000-pound furnace for continuous production. Later the 400-pound unit was installed for development work. The latter furnace has been used profitably for a great many experimental heats, producing special compositions and has been used extensively for making tappets when production schedules have been limited. The small furnace also has proved of great value in melting complex alloys in the manufacture of valve seat inserts.

High temperature and mixing action in the furnace are of special importance with those materials, whose combined carbon must be in a

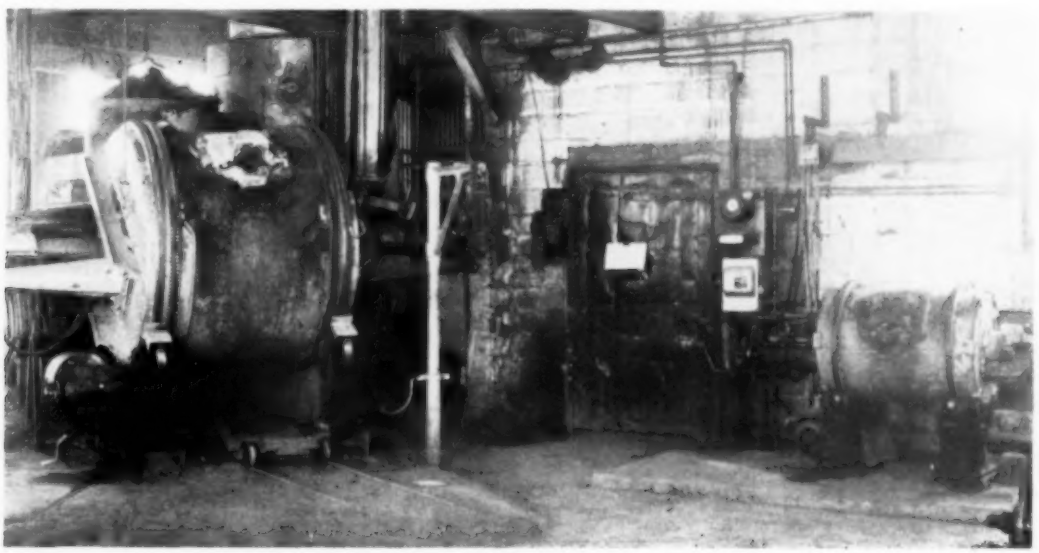


Fig. 3—Two electric furnaces of 6000 and 400 pounds capacity used for melting. The large furnace is mounted on a scale to facilitate correct charging weights

Fig. 5—Cross section of tappet showing chilled face and machinable gray stem

stable form at high temperatures to retain red hardness. Excellent work has been done with the small furnace in the development of cam shafts, manifolds, gear blanks, glass molds and a variety of special permanent mold work.

Many tests carried out by the Eaton-Erb Foundry Co. indicate that the rocking action of the furnace improves the physical characteristics of the castings produced through uniformity of the bath and complete solution of alloys or other ingredients of the charge. The combination of high temperature and mixing of the metal with the highly deoxidizing conditions maintained in the electric furnaces also are said to be important factors in the firm's production of high quality castings.

An important part of the firm's work is the manufacture of automotive tappets and piston rings. Due to the increasing speed and more drastic service requirements of the modern automobile and airplane engine, it became necessary to produce a stronger tappet. In connection with this work and particularly when pouring the iron into permanent mold castings, the Eaton-Erb company has found its electric furnaces of distinct value.

Fig. 5 illustrates the type of tappet used for mushroom valve operation. The head is cast against a chill giving a completely white iron face, while the stem is kept machineable. It is necessary to maintain high shock resistance in the head and neck while the face must have excellent wear-resisting qualities. The depth of chill is of great importance and is kept within narrow limits. A standard tappet test which simulates extremely adverse service conditions in a motor is conducted on a machine developed by the tappet manufacturer as a standard test method.

Through close control over composition and temperature, the firm has developed an electric iron tappet, both permanent mold and sand cast, which has gained an enviable reputation for strength and wear-resistance.

Fig. 2 shows a group of electric iron tappets as made for various motor cars, and includes both the rough castings and finished products. As may be surmised, the variety of weight and design necessitates precise control over the metal composition and the casting temperature to insure maximum physical properties.

Piston Rings Are Strong

To meet the demands of the automotive industry the Eaton-Erb Foundry Co. produces a high quality piston ring. The production of piston rings in electric furnace iron has resulted in increased strength and tension and other improvements. These improvements, which are obtained either by duplexing or cold melting, are: Higher strength, better tension, elimination of hard spots, improved machineability, and uniformity.

The properties attained on the electric furnace iron produced by the Eaton-Erb Foundry Co. are as follows:

Rough Castings After Splitting at the Gate

Load required to break in pounds..18.4

Stretch in inches ..... 0.979 inches

Finished Rings

Load required to break in pounds.....11.4

Stretch in inches ..... 0.781 inches

The result of tests for strength and stretch covering an average of ten tests on 3⅝-inch x 5/32-inch finished oil control rings shows the load required to break to be 19.1 pounds and the stretch 1.472 inches.

Elimination of hard spots and the uniformly better machineability result in savings of great importance in the machine shop.

In modern automotive design a great many castings must be made of special types of iron to meet the more (*Please turn to page* 40)

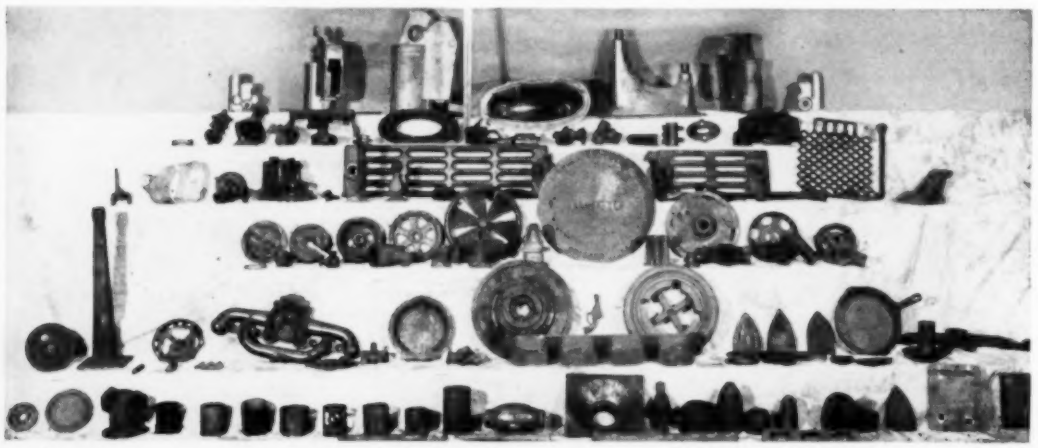


Fig. 6—Adaptability of the permanent mold process is indicated by the variety of castings which have been made by that method

Practical Problems Feature Program

A. F. A. arranges technical sessions, shop courses and round tables for all branches

A WELL balanced and complete program for the annual convention and exhibition of the American Foundrymen's association, to be held in the Stevens hotel, Chicago, June 20-23, is being completed rapidly by the program and papers committee of the association. Technical sessions, round table discussions, shop courses and committee meetings will give opportunity for the discussion of important technical and practical problems of the industry.

With interest in the shop courses growing rapidly since their first introduction several years ago, special attention is being given to that feature of the program. In the cupola course, the session on Tuesday of convention week will be devoted to "Small Cupolas and Their Operation." On Wednesday the meeting will consider "Gating Terms," on Thursday, "Structure of Gray Cast Iron," and on Friday, "Alloy Cast Iron."

All Branches Represented

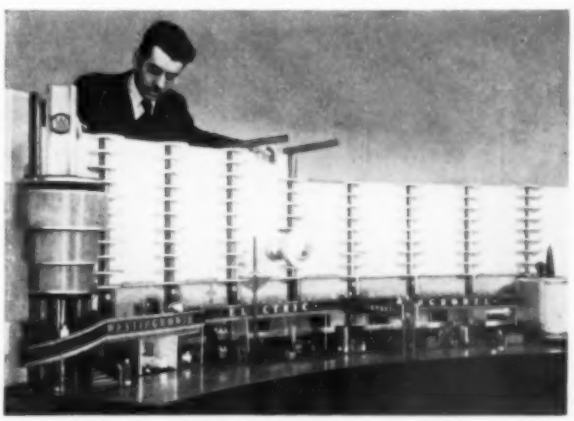
The first sand session will consider the "Application of Sand Control To Continuous and Jobbing Foundries." Other meetings will be devoted to a study of the "Classification of Foundry Sand," "Surface Defects" and "Core Sand." Round table discussions will be provided for the malleable and nonferrous groups.

All branches of the industry have been provided splendid representation on the preliminary schedule of technical events. Steel foundrymen will hold three sessions, two devoted to a symposium on alloys for steel castings, and the third to general steel castings problems. Molybdenum will be considered at the symposium by H. W. Gillett, Battelle Memorial institute and J. L. Gregg, Bonney-Floyd Co., Columbus, O. Jerome Strauss, Vanadium Corp. of America, Bridgeville, Pa., will discuss vanadium data; A. G. Zima, International Nickel Co., New York, will speak on the use of nickel in steel castings and J. H. Critchett, Union Carbide & Carbon Corp., New York, will review the use of chromium as an alloy for steel castings.

Two papers of unusual interest will be presented at the third session on steel founding. Fred Grotts, Continental Roll & Steel Foundry Co., East Chicago, Ind., who has made an intensive study of impact testing, will present a paper on the dynamic properties of steel castings. C. W. Briggs and R. A. Gezelius, both of the U. S. Naval Research laboratory, Bellevue, Anacostia, D. C., will review the results of an intensive research in a paper "Studies on Solidification and Contraction and Their Relation to the Formation of Hot Tears in Steel Castings." In addition, the proposed new specifications for steel castings, which will be submitted to the American Society for Testing Materials the following week, will be discussed.

Gray iron will be featured at both the A. F. A. and the A. S. T. M. meetings. The gray iron division of the A. F. A. has arranged three meetings at which papers on melting methods, alloys and other important subjects will be discussed. At least three papers will be devoted to melting methods, covering developments in air furnace, direct arc and indirect arc electric furnaces for gray iron. The exchange paper of the Institute of British Foundrymen will be presented by Ben Hird on the subject of "Sea Coal."

A feature of the gray iron program will be the session on tests and specifications, designed to present practical information on the significance of testing and its limitations; the mechanism of gray iron testing and (*Please turn to page* 48)



Examining a model of the electrical engineering exhibit to be shown by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., at the Chicago Fair

Fig. 12—Pouring a complicated steel casting weighing nearly 20 tons at the Detroit Steel Casting Co.

Company Classifies Steel Castings

Five general classes cover entire range of all carbon and alloy castings produced

By FRANK G. STEINEBACH

DURING the past quarter century the steel foundry industry has made exceptional progress in the advancement of the art of steel castings manufacture. Through technical research, mechanical development and an increase in the knowledge of practical foundry methods, the quality of the product has improved by leaps and bounds. Today steel foundries are equipped to produce castings possessing physical properties and other service characteristics which were considered beyond the realm of possibility not so many years ago.

Designing engineers have castings of plain carbon steel and numerous alloy steels available for practically any type of requirement which must be met. At the same time foundrymen are anxious to assist the engineer in the proper selection of the steel casting best adapted to the particular purpose under consideration. Nevertheless, the engineer in all too many instances, is not familiar with the materials which are available and therefore continues to specify physical properties which will not permit castings to provide maximum utility in use. Also he may be tempted to employ engineering materials fabricated by methods other than those existing in the foundry.

This situation recently led the management of the Detroit Steel Casting Co., Detroit, to prepare a series of classifications covering the entire wide range of carbon and alloy steel castings

Fig. 13—Drag mold for large machine bed to be poured of electric furnace steel

produced in its foundries. These steels extend from a low carbon variety having a tensile strength of from 55,000 to 65,000 pounds per square inch to a high carbon, chrome-molybdenum steel with a tensile strength from 120,000 to 150,000 pounds per square inch. Under each classification the company has suggested suitable applications for the particular class.

Steel castings produced by the company are divided into five general classes, designated as D, E, S, C, and O. The physical properties of the various classes are shown in the accompanying table, and as will be noted, four of the five classifications have several divisions, so that 11 specific classifications are provided. A study of the accompanying table will indicate clearly the wide variety of physical properties available for the engineer in the steels falling in the five main classifications. For example, the maximum strength available in the castings ranges from 55,000 to 65,000 pounds per square inch in the D-1 classification to 120,000 to 150,000 pounds per square inch in the C-2 classification.

Class D Has Four Divisions

Class D, which consists of carbon steels of varied content to meet specific requirements, has four separate divisions. D-1 is a low carbon steel made in the electric furnace and is annealed or normalized according to the type of casting requirement. That material is recommended for castings demanding case hardening, high electrical permeability and low coercive force and for castings subject to rapid temperature variations in service where it would be detrimental for the material to harden.

Normal mild steel castings, classed as D-2 are produced in the electric furnace or the open-hearth furnace and are annealed or normalized according to type and requirements. The company points out that this steel is representative of the best obtainable for all cases for which the generally accepted commercial casting is suitable. D-3, a medium carbon steel, also is

Fig. 14—Regularly scheduled tests maintain the foundry sand at a definite standard

produced either in the open hearth or the electric furnace and is annealed or normalized according to type and requirements. The material is quite resistant to wear and therefore is recommended as advantageous for gearing and similar purposes and for general engineering applications demanding a somewhat higher strength than standard, but not justifying the expense of alloy additions.

The final division of the D classification, namely D-4, is a special medium carbon steel made in the electric or open-hearth furnaces and annealed or normalized according to type and requirements. That material is practically a plain carbon steel subjected to special melting furnace treatment. Responsiveness to heat treatment is increased by an exceedingly low alloy content and the castings made of the steel are applicable for purposes necessitating a better all around performance than given by standard castings, but at a low cost. It also is pointed out that the high yield ratio, as shown in the accompanying table, is valuable for moving parts carrying heavy stresses.

Low alloy steels of manganese nickel and manganese molybdenum types with varied carbon contents to meet different specifications, are designated as class E. (*Please turn to page* 43)

Classification of Physical Properties
Eleven Types of Steel Castings

Classification	Maximum Strength Pounds Per Square Inch	Yield Point Pounds Per Square Inch	Elongation In 2 Inches Per Cent	Reduction In Area Per Cent	Brinell Hardness
D-1	55,000-65,000	30,000-35,000	30-40	40-60	125-135
D-2	65,000-75,000	35,000-45,000	25-35	35-50	135-145
D-3	75,000-85,000	45,000-50,000	18-25	30-40	160-180
D-4	80,000-90,000	50,000-60,000	20-30	35-50	150-170
E-1	80,000-90,000	50,000-60,000	20-30	35-55	150-180
E-2	85,000-95,000	55,000-65,000	20-30	35-50	170-190
S-1	95,000-110,000	60,000-80,000	15-20	25-40	*179-228
C-1	90,000-120,000	70,000-85,000	12-20	20-35	*165-210
C-2	120,000-150,000	90,000-120,000	7-12.5	15-25	†280-420
O-1	100,000-120,000	65,000-75,000	12-20	20-30	180-200
O-2	85,000-100,000	60,000-70,000	15-25	25-40	160-190

*Depending on tensile requirements. †As desired to suit intended purpose.

Melting Gray Iron in the Crucible

Melting medium offers possibilities when foundry must handle small heats

By WILLARD H. ROTHER
Buffalo Foundry & Machine Co.

DUE to the fact that production has been reduced to a minimum in most foundries, and that insufficient tonnage is to be had for daily heats, plants are confronted with the problem of melting small heats of cast iron for emergency work with as little delay as possible.

Crucible melting in an oil fired tilting furnace meets this problem exceedingly well and at a nominal cost. An oil fired crucible furnace, as a melting medium, compares favorably with the electric furnace for superheating and refining cast irons. Crucible melting is indispensable in the melting of the more expensive alloys for ladle additions. This is especially so in cases where specifications are rigid with limited tolerances. By this method the assurance of a proper mixture is increased greatly. However, caution must be exercised in the selection of the proper type of crucible for certain alloys, due to chemical attack on the lining

Tests Crucible Melting

For melting ordinary cast irons, our experience has been on silicon carbide crucibles which last from 15 to 25 heats per crucible. The author, having had no experience with graphite crucibles for that type of melting, can not pass upon their suitability for the purpose.

Full crucible heats can be melted down in from 3 to 3½ hours, depending of course upon the type of raw materials used and the temperature at which the work is to be poured. Oil consumption is quite low, amounting to from 5 to 7 gallons per 100 pounds of melted metal and the refractory cost also is low.

As an example of what can be accomplished by crucible melting, the author selected, for test purposes, daily run foundry scrap having a silicon content of 1.70 to 1.90 per cent and a total carbon content of 3.40 to 3.50 per cent. This iron, when cast from a cupola into A.S.T.M. arbitration bars, had an average transverse strength of about 2900 pounds, and an average deflection of 0.15 inches. These figures were obtained from bars 1.25 inches in diameter that were broken on a 12-inch span. The tensile strength of this iron averaged about 25,000 pounds per square inch.

This metal was melted down in the crucible and heated to a temperature varying from 2700 to 2900 degrees Fahr. Twelve arbitration bars of the same dimensions as previously referred to were cast and broken in the same manner. These bars in the transverse test broke with an average load of 4900 pounds, and an average deflection of 0.17 inches. The tension bars broke with an average load of 41,000 pounds per square inch. This would indicate that considerable refinement in the metal had taken place. The increase (*Please turn to page* 50)

Full crucible heats can be melted down in from 3 to 3½ hours, depending on materials used and pouring temperature

Fig. 1—The drags molds are sprayed with wet blacking

Cylinder Molds Are Skin Dried

Drags sprayed with blacking are placed on a conveyor which travels through an oven

MATERIALS and methods employed in making molds for automobile cylinders have varied between a complete green sand outfit and one in which both the inside and the outside of the casting have been formed in dry sand cores. In the early days of the industry the invariable practice was to bake the molds in the oven and to make all the cores from a mixture which also could be dried. In later years the practice almost exclusively has been to form the mold in green sand and to use dry sand cores made from fine sharp sand.

Occasionally a batch of sand not conforming closely to specifications finds its way into some of the flasks and the result is a number of scrap castings. As an insurance against this occasional and intermittent form of trouble, R. J. McSherry, foundry manager, the Studebaker Corp., South Bend, Ind., decided to black wash and skin dry the drag face of all cylinder molds before placing the cores. Details of the device were worked out and installation of the equipment shown in the accompanying illustrations was made by the Drying Systems Inc., Chicago. It is claimed that the installation has fulfilled expectation. The castings present a better appearance than formerly and—what is considered more important—one of the hazards incident to the employment of the human element, has been eliminated. With the exception of the spraying operation, (*Please turn to page* 48)

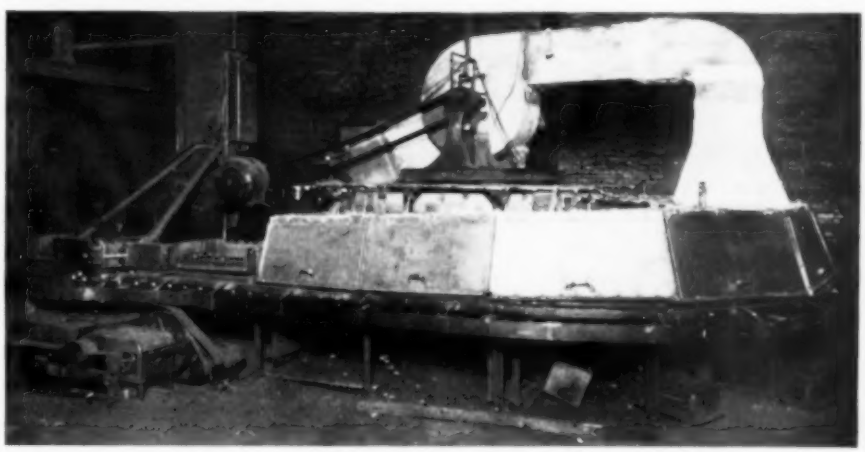


Fig. 3—This view on the discharge side of the oven shows the driving unit at lower left, also the heating and air distributing device above the oven

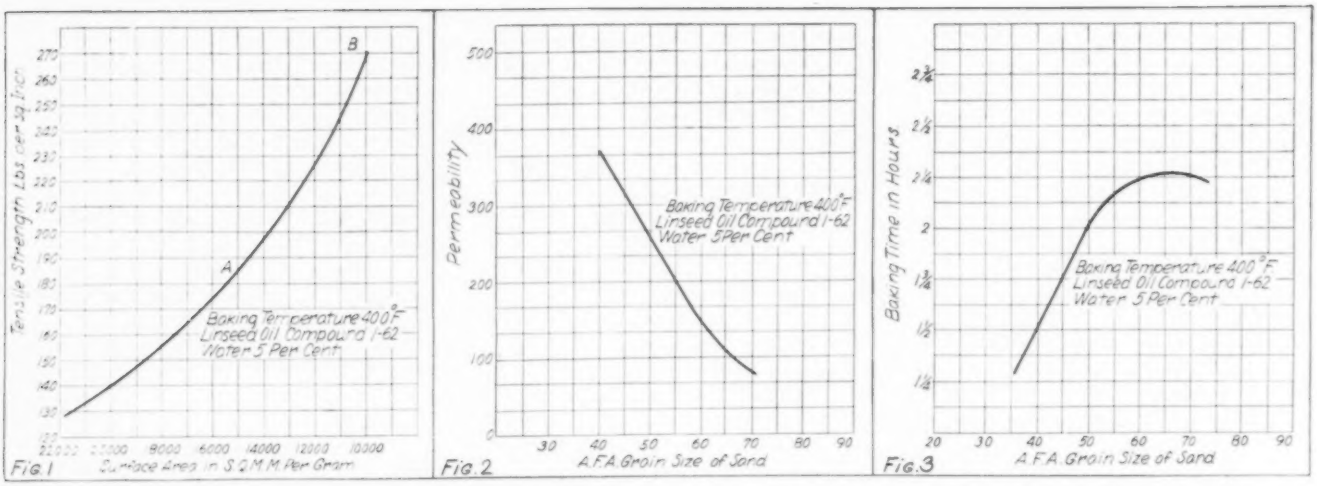


Fig. 1—Relation of core strength to surface area of sand. Fig. 2—Permeability of baked cores as related to grain size. Fig. 3—Baking time for maximum strength as determined by grain size

Controlling Properties of Cores

Numerous causes may vary core quality and set up a disturbance in the mold

By HARRY W. DIETERT
and
FRANZ VON VALTIER

BETTER castings are produced at a lower loss when the physical properties of a core are controlled. Such variation of the core quality as may be caused by a change in fineness of sand, baking temperature, baking time, gas content, rate of gas evolution, strength and hardness easily may cause conditions in a mold which will set up a disturbance of sufficient violence to result in a defective casting. At times the green sand is taxed heavily by this disturbance and fails under the abuse, the casting defect being charged to the molding sand.

A variation in the fineness of core sand may cause the strength, permeability, baking time or gas content to change sufficiently to result in scrap producing cores.

The tensile strength of a core decreases rapidly as the surface area of the core sand increases. As an illustration, note Fig. 1. A core made from a sand with a surface area of 10,000 square millimeters per gram will give tensile strength of 268 pounds, while a core made from a sand with twice that amount of surface area will have a tensile strength of only 140 pounds. The former sand would have an average A. F. A. fineness of approximately 50 mesh, while the latter would have approximately 70 mesh.

Shape of the core sand grains has great influence on the strength of a core. Round (spherical) shaped sand grains with a 50 mesh average fineness will have approximately 10,000 square millimeters surface area per gram, while sharp (angular) sand grains with a 50 mesh average fineness will have approximately 15,000 square millimeters. The round sand grains will give a core strength of 268 pounds and the sharp grains will give a core with a strength of 185 pounds when other conditions remain constant. These two points are represented in Fig. 1 by *A* and *B* respectively.

Fineness Lowers Permeability

Baked permeability of cores decreases rapidly as the fineness of the core sand increases. Fig. 2 illustrates this point clearly.

The time required to bake cores is related definately to the fineness of the core sand. Fig. 3 shows the relation between baking time and fineness of sand for cores bonded with linseed oil compound. The baking time to secure maximum strength for an open core sand with a 40 mesh average fineness is 1½ hours. When the core

sand fineness is increased to 60 mesh, 2¼ hours will be required to secure a maximum strength core. An increase of fineness above 60 mesh does not materially affect the baking time.

A most interesting point is that the gas content of thoroughly baked cores will be greater, that is, it will give off more gas in the mold, as the fineness of the core sand increases. A core made from 40 mesh sand shows 13 cubic centimeters of gas, Fig. 4, while a core of 70 mesh sand shows 15.5 cubic centimeters. The cores were baked sufficiently to secure a maximum strength.

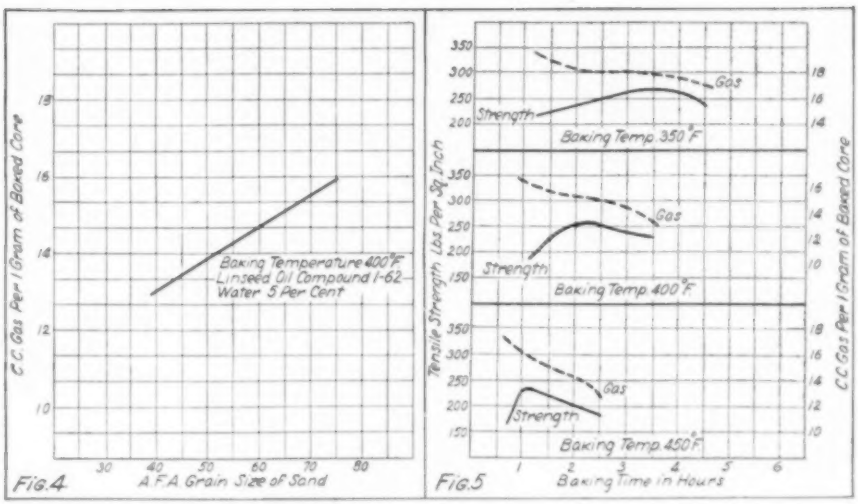


Fig. 4—Relation of grain size to core gas. Fig. 5—Baking temperatures as related to tensile strength and core gas

The proper baking temperature for a particular core binder and sand should be determined from correlation of strength, baking time and hardness of core. The curves shown in Fig. 5 will be used to illustrate that point. The baking temperatures used for the linseed oil core compound under investigation, Fig. 4, were 350, 400 and 450 degrees Fahr. The baking time was varied from 1½ to 4½ hours for this investigation.

The strength curve, Fig. 5, for 350 degrees Fahr. baking temperature shows that 3½ hours were required to secure the maximum strength of 270 pounds. A variation of baking time does not affect materially the strength property of the core at that low temperature.

A baking temperature of 400 degrees Fahr. reduces the baking time to 2 hours at the expense of the maximum strength which was reduced to 255 pounds.

A further increase of baking temperature to 450 degrees Fahr. reduces the time to 1 hour with a further reduced strength of 237 pounds.

The maximum surface hardness of a core is secured by a low temperature and a long baking time.

The gas content of a core is a direct measure of core blow defect possibility, assuming the mechanical venting remains constant.

The relation between gas content and grain fineness was discussed in connection with Fig. 4 The effect of baking time and gas content is illustrated in Fig. 5. It may be noted that the gas content is between 15.6 and 16.0, or practically constant, at the various baking times and temperatures required to give maximum strength. In other words, if core baking practice is based on conditions to secure maximum strength, then the gas content is little affected by baking temperature or baking time.

The quantity of gas which a core will give off in the mold is proportional to the quantity of oil placed in the mix, assuming other conditions remain constant. Fig. 6 shows this relation for a vegetable core oil (*Please turn to page* 50)

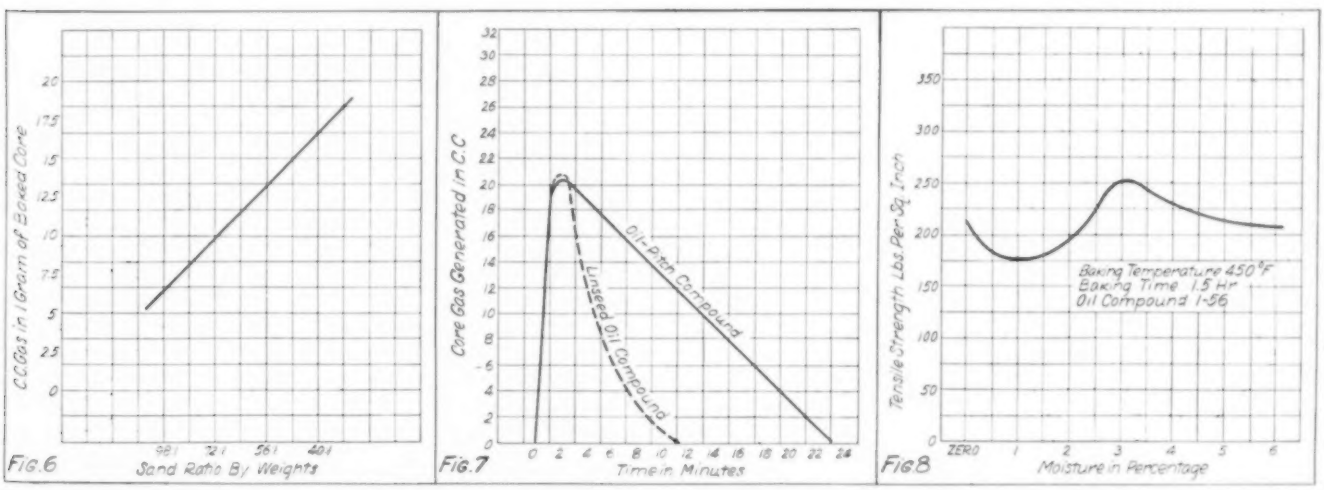


Fig. 6—Relation of the oil sand ratio to the core gas. Fig. 7—Rate of gas evolution in 5 grams. Fig. 8—Effect of moisture percentage on tensile strength

Electric Furnace Retired After Fifteen Years of Continuous Service

Fig. 1—In 15 years, this furnace melted a total of 111,438 tons of steel

AFTER 15 years of continuous service at the plant of the Sivyer Steel Casting Co., Milwaukee, the world's first electric furnace of the Moore type is being erected as a permanent monument at the Lakeside power plant of the Milwaukee Electric Railway & Light Co. This furnace was designed and built in 1917 by W. E. Moore, now with the Pittsburgh 'Lectromelt Furnace Corp., Pittsburgh, while working in conjunction with engineers of the Milwaukee Electric Light & Power Co.

Made Total of 32,844 Heats

The furnace made a total of 32,844 heats in the time it was in service, representing 111,438 tons of steel, and with the exception of a time in 1921, averaged 18 to 20 hours a day. A considerable portion of the entire tonnage melted was special carbon and alloy steel, and in many months, at least 70 per cent of the output consisted of such steels. At the present time, the company makes 27 distinct compositions of alloy steels, in addition to several varieties of corrosion and heat resisting castings.

A cast steel tombstone, poured from the last heat will be erected with the furnace. Chemically that heat was of the manganese-nickel grade having a carbon content of 0.35, manganese 1.10 and nickel 0.81. In the normalized and drawn condition it had a yield point of 55,000 pounds per square inch and a tensile strength of 89,000 pounds per square inch.

A new furnace of the same type but of improved design has been installed by the Sivyer company. A feature of the new unit is the more efficient method of charging scrap. In the old furnace it was necessary to charge the scrap through the door, but in the new unit, the roof and superstructure are lifted from the body and swung sideways 90 degrees by a hydraulic pump and pressure system, as shown in Fig. 2. This permits the entire charge of 3½ tons to be dumped into the furnace at one time and the roof then swung into position.

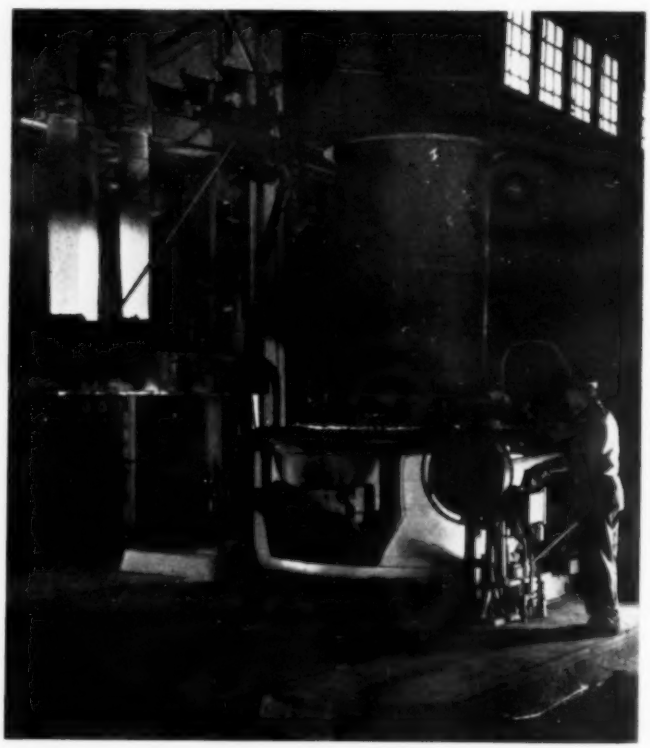


Fig. 2—Provision for efficient charging of scrap is a feature of the new electric furnace recently installed

Gray Iron Institute Meets

Consideration of merchandising, technical and cost problems features convention at Cleveland

UTILIZATION of the tentative specifications for gray iron, as adopted last June by the A. S. T. M., in furthering the merchandising campaign of the industry featured several discussions at the annual meeting of the Gray Iron institute in Cleveland, March 22. Speakers stressed the importance of these specifications in the development of a certification plan for gray iron, and in establishing complete confidence in gray iron on the part of users of engineering materials.

Reports of officers and committees occupied the morning session. A. E. Hageboeck, Frankite Corp., Moline, Ill., and president of the institute, pointed to the remarkable progress the group has made since its founding five years ago. B. H. Johnson, R. D. Wood & Co., Philadelphia, and a past president of the group, stressed the absolute necessity of a program of co-operative effort for research and development. As an example of what is being accomplished by co-operative research, Mr. Johnson cited the work of the British Cast Iron Research association in the field of alloy irons and in designing the balanced blast cupola. Progress, he said, can come only through unceasing efforts toward new developments.

Service To Members Increased

R. D. Phelps, Francis & Nygren Foundry Co., Chicago, treasurer of the institute, reported on the sound financial condition of the organization, and Arthur J. Tuscany, manager, in his annual report, pointed out that all curtailments which have been made by the institute have in no way decreased the service to members. In fact the service has been increased substantially since the last annual meeting and future plans anticipate further extensions. Mr. Tuscany also called attention to the work of the local chapters, the progress being made in bringing the value of gray iron as an engineering material before groups of engineers and designers, and other activities of the group. In closing he expressed the opinion that opportunities for the gray iron industry never were better, providing the individual members are alert to grasp the opportunities now within reach.

The report of the nominating committee, presented by Carl S. Neumann, Union Mfg. Co., New Britain, Conn., was adopted, thus electing the following to the board of directors for a 3-year period: J. D. Coltman, Bullard Co., Bridgeport, Conn.; William T. Mellow, Liberty Foundry Co., St. Louis; H. P. Spilker, Sterrit-Thomas Foundry Co., Pittsburgh; and A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis. The board met that evening and elected the following officers: President, A. E. Hageboeck, Frankite Corp., Moline, Ill.; first vice president, J. H. Bruce, Bowler Foundry Co., Cleveland; second vice president, E. B. Sherwin, Chicago Hardware Foundry Co., North Chicago, Ill.; treasurer, R. D. Phelps, Francis & Nygren Foundry Co., Chicago; assistant treasurer, H. C. Wilson, Cleveland Co-Operative Stove Co., Cleveland.

Freak Use of Fundamentals

A. C. Denison, Fulton Foundry & Machine Co., Cleveland, in a paper "Relation of Uniform Costing to Profits of Individual Members," expressed the opinion that in the main cut-throat prices, discussed so extensively today, are honest prices, obtained by the freak use of the fundamental principles of cost accounting. He presented several illustrations to show how ignorance of certain cost factors will result in selling the product below the cost of manufacture, and stated the great need of the industry is for a more universal use of the standards for costing, estimating and pricing. Cost groups will help to that end.

A paper by P. E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O., entitled "The Why of Industry Standards," was read by A. E. Grover, cost consultant for the institute. Mr. Rentschler stated that a well organized cost system is the only means of showing management what product or products are profitable, where wasted capital, material or labor exist, and the individuals responsible for operating profits or losses.

William J. Grede, Liberty Foundry Co., Wauwatosa, Wis., presented an interesting paper prepared by John L. (*Please turn to page* 49)

Through the years with THE FOUNDRY

In 1929, a party of American foundrymen attended the international foundry congress in London, saw many historic places including the famous Westminster Abbey

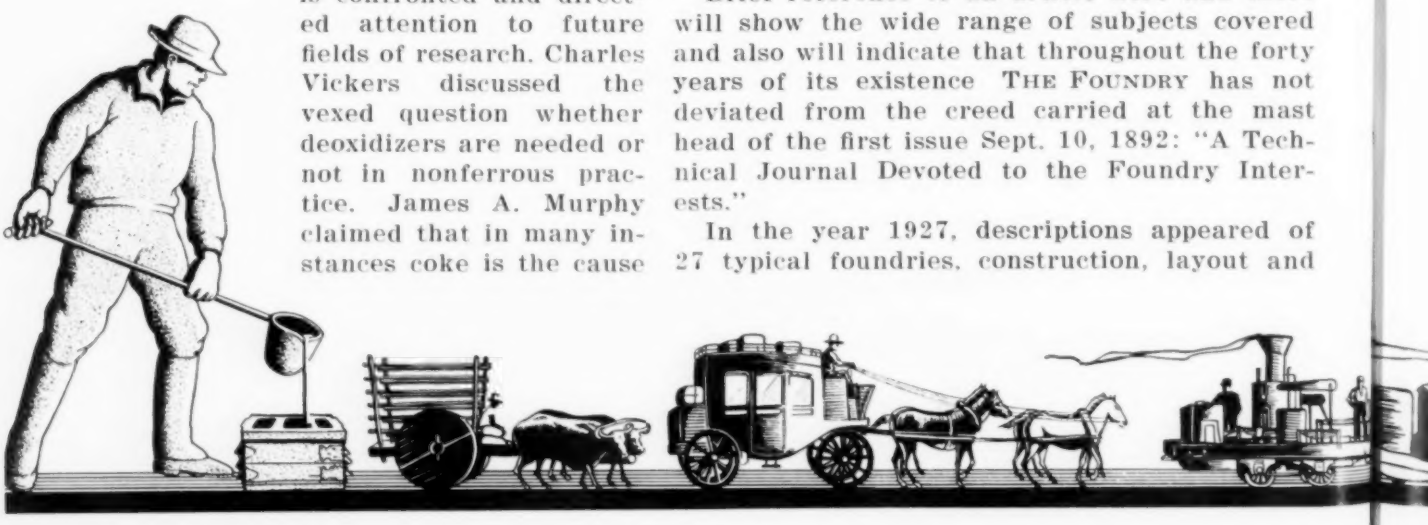
INTERESTING articles in the Jan. 1, 1927, issue included a description of the methods and equipment employed by the American Cast Iron Pipe Co., Birmingham, Ala., for the production of centrifugally cast iron pipe in sand lined molds. The late G. K. Elliott presented a paper in which he deprecated the use of the shear test for cast iron. R. A. Bull, described the operation of the electric furnace in the production of steel castings. R. F. Harrington described experiments and results incident to the addition of clay in the sand heap.

The plant of the Walworth Co., Boston, was described in the Jan. 15 issue. H. A. Schwartz contributed an illuminating paper under the title "What Does a Buyer Want in Malleable Iron?" R. A. Bull pointed out some of the impossible specifications with which the steel foundryman occasionally is confronted and directed attention to future fields of research. Charles Vickers discussed the vexed question whether deoxidizers are needed or not in nonferrous practice. James A. Murphy claimed that in many instances coke is the cause of leaky castings. J. H. Andrew and H. Hyman (England) contributed a paper on temperature growth in cast iron. Another British paper on the construction of a large steel stern frame was contributed by H. V. Fell. Commenting editorially on the importation of bells, THE FOUNDRY wanted to know why we can't make them here. The first of the series "What Others Are Thinking," a digest of foreign foundry literature, appeared in this issue and has continued up to the present.

The futility of attempting even a list of the important articles which appeared in THE FOUNDRY in the six-year period 1927-1932 will be realized when one takes into consideration that the index for each yearly volume occupies a double column on 13 pages, and the editorial section of the magazine alone for each year runs to approximately 1000 pages.

Brief reference to an article here and there will show the wide range of subjects covered and also will indicate that throughout the forty years of its existence THE FOUNDRY has not deviated from the creed carried at the mast head of the first issue Sept. 10, 1892: "A Technical Journal Devoted to the Foundry Interests."

In the year 1927, descriptions appeared of 27 typical foundries, construction, layout and



method of operation and approximately the same number appeared in each of the later volumes. In addition to the United States and Canada, many foreign countries were included in this list. A prominent establishment in Sydney, Australia, figures with the international date line and other notable features observed by H. P. Kreulen on a round trip to Australia, New Zealand and way points beginning and ending at Vancouver, British Columbia.

In the same year THE FOUNDRY carried a description of a 190-ton ingot mold made at the plant of the Bethlehem Steel Corp., an oven for seasoning crucibles; the trade school maintained by the Ford Motor Co., for the education principally of orphan boys, or boys in indigent circumstances; of the methods pursued at the plant of the Gorham Co., Providence, R. I., in the construction of bronze statuary; an aluminum church steeple in Pittsburgh; a singularly illuminating description on the origin and developments of chaplets; a permanent mold symposium; common defects in gray iron castings, their cause and remedy; effect of nickel on cast iron. S. W. Utley in considering the subject of fair prices pointed out that low prices do not increase the use of castings. More castings are bought when prices are rising or when they are high, than when prices are low or falling.

Heat Treating Cast Iron

O. W. Potter described experiments with heat treated cast iron and Paul Ramp illustrated his methods of teaching foundry apprentices. David McLain saw no cause for alarm in adding scrap to the blast furnace burden. Francis J. Clamer, founder of the Ajax Metal Co., and father of G. H. Clamer, a past president of the American Foundrymen's association, died in Philadelphia May 18 at the age of 86. The first page of "The Family Album" appeared in the issue of June 15. J. S. Schoefield's Sons Co., Macon, Ga., celebrated a 75th year anniversary and J. D. Capron presented a comprehensive paper on the subject of centrifugal casting. In Sept. 15 issue THE FOUNDRY presented the first authentic and accurate account of the Ford setup in River Rouge for the utilization of direct metal in the foundry.

Early in 1928 it was noted that: "With the turn of the year passed, signs of development are shown in support of the statement made late in 1927 that business would be better in the new year. Railroad purchases have picked up, December orders for 13,000 cars giving encouragement to foundries making railway sundries. Unfilled orders for locomotives show a gain for the first time in seven months. The first of a series of 16 articles on cleaning castings by Frank G. Steinebach, managing editor THE FOUNDRY, appeared in the Feb. 15 issue and the other articles in the series appeared in subsequent issues up to Dec. 1.

Forecast Is Optimistic

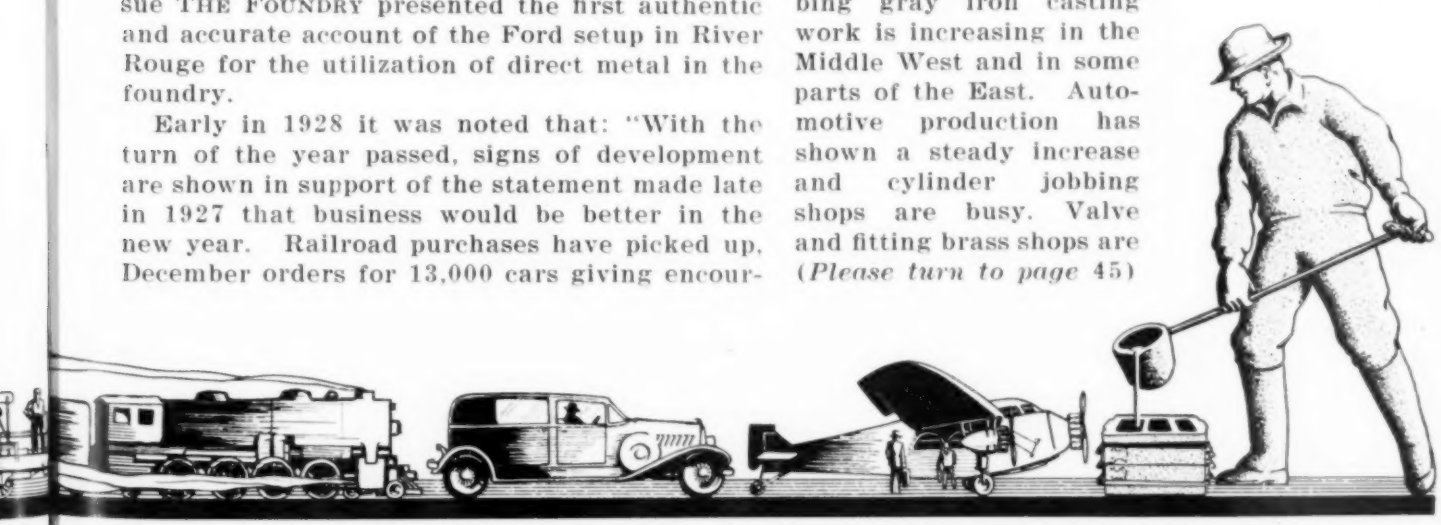
In February the National Automobile chamber of commerce based an optimistic forecast of 4,500,000 cars in 1928 upon attendance at the various shows. Iron and steel production was moving upward, particularly in the Cleveland, Pittsburgh and valley territories. Walter Piper of Beardsley & Piper, Chicago, was severely injured in an airplane accident, at Sharon, Pa. A contract was signed in Moscow between the metal trust of the Russian Soviet government and Frank D. Chase, Inc., Chicago, to build a gray iron foundry in Podolsky, a suburb of Moscow, with a yearly capacity of 150,000 tons. Preliminary work and subsequent supervision were in the hands of C. R. Cady. In the Jan. 15, 1931, issue of THE FOUNDRY Mr. Cady presented a description of the plant.

Desire on the part of gray iron foundrymen to set up an organization to cope with the problems of that particular branch of the industry culminated in a conference at Carnegie Institute of Technology, Pittsburgh, March 13, 1928. At the Philadelphia convention of the A. F. A. May 18, the Gray Iron institute was set up on a permanent basis.

Automotive shops were busy and those which depended on jobbing shops for castings were ordering in anticipation of increased output. Cast iron pipe shops were operating at 70 to 75 per cent of capacity. Practically every issue of THE FOUNDRY in 1928 presented articles dealing with prices and business conditions.

In the April 1 issue it was noted that: "Foundry operations are picking up with the advance of spring. General jobbing gray iron casting work is increasing in the Middle West and in some parts of the East. Automotive production has shown a steady increase and cylinder jobbing shops are busy. Valve and fitting brass shops are

(*Please turn to page* 45)



Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, N. K. B. Patch

Wants Mixture for Auto Brake Drums and Sleeves

We are figuring on two jobs. One is brake drums weighing from 50 to 80 pounds each which must have good wearing quality. What mixture would you advise? The second is sleeves 5 inches in diameter and 15 inches long which are machined all over. The metal thickness in the rough is ½-inch and they must resist an air pressure of 80 pounds per square inch. We thought of using a good green sand core, using a perforated 3-inch pipe for the arbor, and a brass tube for a core box. We intended to gate in the end with several small gates made right on the pattern and running nearly all the way around the front, and a flow-through on the opposite end. What is a suitable mixture for these?

We believe that the brake drums and the sleeves will be satisfactory if they are made of dense, gray iron with a medium silicon content made from a mixture containing about 25 per cent steel scrap. The exact silicon content will depend on a number of factors including the type of material charged into the cupola, melting practice, and the method of molding. However, it is suggested that you try metal in which the silicon content is about 2 per cent, raising or lowering it slightly to obtain a satisfactory metal in the castings. If you want to use alloys, it is suggested that you use approximately the same base mixture as mentioned with the addition of 0.50 per cent chromium and 2.0 per cent nickel. In place of the nickel and chromium, you might try the addition of about 0.50 per cent molybdenum.

From your description of the method you expect to employ in molding the sleeves, it appears to us that you intend to mold the sleeves on their sides. We believe that you will obtain better results if you mold the sleeves vertically using a ring of pop gates on the top. With the proper draught on the pattern, the sleeves may be molded so that they will leave their own green and cores. A flat cope containing the pop gates and pouring basin is used to cover the mold.

Gives Formulas for White Metals for Patterns

We are operating a small foundry in connection with our state college, and we would like to know if you can send us a formula for a good pattern metal which we can make up and use with the limited facilities at our disposal.

There are a number of white metal pattern alloys that are used successfully. Perhaps the most suitable for your use would be one composed of 50 per cent tin and 50 per cent zinc which could later be used in making brasses containing tin. Another alloy quite similar to that contains 50 per cent tin, 48 per cent zinc and 2 per cent bismuth. While the amount of bismuth contained in the alloy is small, it, unlike the first mentioned alloy, could not be used readily in making brass. A third pattern alloy that has been recommended contains 58.5 per cent tin, 22 per cent zinc, 12.5 per cent lead, and 7 per cent antimony. All of the alloys mentioned have comparatively low melting points, are cast easily, and can be soldered if necessary.

Outlines Facing Sand Mixture for Malleable Iron

Can you give me any information on a good facing sand mixture for malleable iron castings of medium weight which have to be enameled? Could the same mixture be used successfully if the castings were plated instead of enameled?

In general facing sand mixtures for malleable cast iron are mixtures to heap sands with the finer grades of local molding sands in such proportions as to give a smooth mold face. They always are much less pervious to air or gas than

the main sand supply of the foundry. In the facing sands is incorporated the smallest sufficient quantity of sea coal to give the desired result. The amount of sea coal will vary from 1 to 20 parts of sand to 1 to 10 parts of sand, and you will have to experiment to find the most suitable combination. The amount of sea coal used will vary with the size of the casting. Small castings *can stand* more sea coal than large castings, but that does not mean that they *need* more. Also larger amounts of sea coal are required with coarser molding sands.

We do not believe that you will have any difficulty in enameling or plating if the castings are cleaned properly before those operations are performed. Investigation in many cases indicates that considerably less difficulty is encountered from the metal and its method of manufacture than with improperly cleaned material.

Spots Show on Faces Of Polished Iron Lamp Bases

One of our customers complains that spots show up on the polished surface of floor lamp bases. Also that the castings are too hard to grind. We have molded these castings face down and face up and have tried various types of gates. We have molded them in various grades of sand and have poured them from an all pig mixture with a silicon content of 2.50 per cent.

Presumably the castings are at least $\frac{1}{8}$-inch thick. During the melting process, iron loses approximately 20 points of silicon which would leave the silicon content of your castings 2.30 per cent. This iron will be fairly hard in a thin casting and will be very hard, particularly around the edges if the sand is damper than usual. Two methods are open to overcome this difficulty. The first is to use an iron of a higher silicon content, 2.75 to 3.00 per cent, either by melting pig iron containing that amount of silicon, or by adding silvery pig or ferrosilicon to your present mixture.

The second method is to raise the castings to a red heat and then allow them to cool slowly. Where a large quantity is involved the castings are placed in an annealing furnace or brick chamber fired by coke, gas or oil. A small number may be buried in a pile of wood and then the wood is set on fire. Where the castings are thin and fragile they must be placed on suitable supports to prevent distortion.

The dirt in the castings is sand either washed in from the runner and sprue, or, sand washed from the face of the mold. Steam escaping upward from wet sand, hard sand, or sand that is not vented properly will cause the iron to boil, and this boiling action will loosen some of the sand or blacking on the face of the mold. Use an open sand, worked as dry as possible and rammed gently. Omit use of the swab. Vent the drag with a wire and see that the steam can escape readily between the bottom edge of the drag and the bottom board.

Bushings May Contain Either Aluminum or Silicon

Two specimens cut from a bushing; one from the top and one from the bottom are being forwarded. The bushing was cast from scrap which consisted of worm gears and red-colored shavings. The castings after shaking out had a whitish color to the skin and it was noticed that while pouring, the top of the risers were white and soapy looking. We would like to know what kind of bronze that would indicate, and the cause of the holes in the bushing.

Without analyzing the samples you have forwarded, it would seem that you have acquired some scrap, either in the worm gear blanks or elsewhere containing aluminum or possibly silicon, either of which if present in your bronzes would be disastrous to the soundness of your castings and to the proper color of the skin. The appearance of the soapy effect on the risers is further evidence of the presence of one or both of those elements.

There is an increasing amount of aluminum bronze sold today which in consequence is increasingly present in the scrap. Likewise there are many of the so-called silicon bronzes being sold which also adds to the danger of silicon being present in the scrap metal. Many worm gears have been made from aluminum bronze. Therefore, it is imperative that you be extremely careful in the selection of the kind of secondary metals you use if you are anxious to produce sound, clean castings in red metals. Undoubtedly, you will find less grief if you will purchase ingot metal of the desired composition from a reputable producer.

You may have to make a careful study of the

Pittsburgh's successful fight to curb traffic accidents was given national recognition recently when Frank J. Lanahan, president, Fort Pitt Malleable Iron Co., and member of the executive and advisory committee, National Safety council, presented a bronze plaque to City Council President John S. Herron. Mr. Lanahan is shown holding the plaque

different types of scrap to learn to differentiate between these other detrimental bronzes and those bronze metals that are serviceable for the production of the types of castings you are making. A characteristic of the aluminum bronze is that it is not brittle at a read heat; whereas the copper-tin bronzes are brittle at a red heat and snap readily. If you take proper care to select your scrap, we believe that you will have no further trouble of the kind exhibited.

Furnace Castings Present Dirty Surface

We are making a gray iron furnace casting, which is causing trouble. We have gated this casting according to different methods, but without exception, every casting contains holes and dirt in the center. We shall appreciate your advice on this subject.

The presence of dirt and holes in the center of the thin plate indicates that the sand does not lie quietly while the molten iron is flowing over it. The best style of gate to adopt is a secondary consideration. Practically any one of several alternative methods will serve satisfactorily, provided the mold is made in a manner that will prevent the iron from boiling while in a molten condition. A possibility exists that your sand is not sufficiently permeable for a job of this kind. If that is the case, no system of gating will produce a satisfactory casting.

However, assuming that the sand is suitable, the evidence indicates that it is not manipulated properly to secure satisfactory results. The two circular pockets generate a vast volume of steam—even under the most favorable conditions—when surrounded quickly with molten iron. Manifestly if this steam cannot escape readily and rapidly through the bottom, it will blow through the metal lying on top. Also it will lift some of the sand. The result constitutes the blow holes and dirt which you find in the present castings.

Your problem is to construct a mold in which the metal will lie quietly. To that end the sand must be highly permeable. It must be rammed gently, particularly on top of the circular green sand cores and must be worked as dry as possible. The sand at present in use may be quite suitable in itself, but may be ruined for this particular casting, by a too liberal use of the rammer and swab. The pockets or cores should be vented either with a ¼-inch wire, or, with a 2-inch plug extending to within 2 inches of the top of the core and removed before the drag is rolled over. Needless to say a passage must be provided for the steam to escape between the bottom board and the lower edge of the drag, or through a hole in the bottom board. A row of vent holes also should be driven around the outside of the two pendent rings.

By observing the foregoing precautions the castings may be gated on top through pencil, wedge or finger gates, or the iron may be poured through several branch gates on opposite sides and in the vicinity of the two rings. The outside gates are preferable in that the rings are filled before the metal commences to flow across the center plate. However, the top gates, pencil, wedge or finger, will admit the iron rapidly enough to discount the disadvantage of having a certain amount of metal fall into the rings before it starts to fill the plate.

Irrespective of what type of gate is employed, exceedingly hot iron is an essential requisite. The logical place for the top gates is over the circular green sand cores so that these parts of the casting may be filled first. If the green sand will not withstand this treatment it may be reinforced by thin circular dry sand cores. These cores are placed in the pattern and rammed up with the remainder of the sand in the mold. Three or four wire nails with the points inserted in the slab cores while green and baked in that position will serve as anchors to hold these cores in place.

Pipe Castings to Resist High Temperature

We have a number of flanged pipe to make 14 inches inside diameter, 1⅛-inches thick and 16 feet in length. In service these pipes are exposed to high temperature and we shall appreciate your opinion on a suitable analysis for the iron.

An iron mixture containing 25 per cent steel and conforming to the following approximate analysis has been found satisfactory for heat resistant castings: Silicon 2.00 per cent, sulphur 0.05 per cent, phosphorus 0.20 per cent, manganese 0.80 per cent. The base of mixture is a bessemer pig iron. Presumably these castings will be molded and poured in a horizontal position, therefore it is pertinent to point out that the molding practice is just as imporant as the metal mixture. If the mold swells, or if the core springs, thus producing an unequal thickness of metal, the casting will either crack or warp in service, irrespective of the quality of the iron.

A strong, rigid flask is required for the drag properly braced with transverse bars, say one in the center and one between the center and each end. If the pipe is bedded in the floor, care should be taken to see that the floor is firm on both sides. Two chaplets will support the core on the bottom, but four will be required on the cope side; two spaced 3 feet apart near the center and the other two equidistant between these and the ends. Eight ¾-inch pop gates spaced approximately 12 inches apart and connected to a long central runner basin will admit the metal to the mold more satisfactorily than the usual sprues, long runner, and a number of flat gates at the joint of the mold either at one or both sides.

Shrinks Are Found When Coupling Is Bored

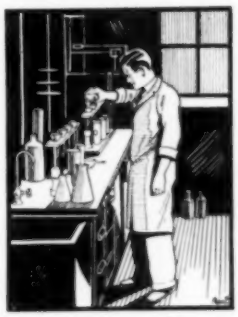
A coupling casting is bored out for various sized shafts ranging from 1 to 2½ inches diameter. What is the best method of gating these castings to insure solid metal in the bore. With 10 per cent steel in the mixture we use an iron showing silicon 2.00 per cent, sulphur 0.08 per cent, phosphorus 0.45 to 0.55 per cent, manganese 0.58 to 0.65 per cent.

The iron mixture to which you refer is quite suitable for shaft couplings 10 inches in diameter. Several methods of gating are practiced, the particular method adopted in any given plant depending to a considerable extent on the personal preference of the man in charge of operation. Satisfactory castings are made by each method provided ordinary precautions are observed. In one prominent mid-west foundry these castings are molded in small round flasks and gated at the joint. The entire mold is formed in the cope part of the flask, which is deep enough to have at least 6 inches of sand over the casting. Where the hub of the casting is higher than usual, a head or runner cup is placed on top of the cope.

In another plant these couplings are poured through four ¼-inch pencil gates located on top of the hub. In the two foregoing methods it will be noted that the casting is molded in the opposite position to what normally might be considered regular practice, that is with the flange resting on the joint of a shallow drag and with the entire mold in the cope. One reason for molding the casting in this position is to insure an absolutely clean face on the side which has to be machined and which fits against the other half coupling in service.

Slow pouring and a high head are the most essential features to be observed, irrespective of the style or position of the gate. In many foundries these castings are molded under a flat cope, entirely in the drag. They are poured through pop gates or pencil gates near the center. Unless the mold is exceptionally well made from a high permeability sand, a gate at the joint may cause the metal to wash away some of the sand at the shoulder of the mold.

Viewing Foundry Developments



At Short Range

IN PREPARING material to patch the cupola, the tendency of most melters is to use an excess of clay in the mud mixture and always too much water, with the result that the patch sometimes is blown from place due to entrapped steam. Furthermore, both excess clay and excess moisture increase shrinkage which causes excessive cracking with spalling off of the dried patch.

♦ ♦ ♦

One method of making alloy iron camshafts is to cast the cams in sand molds, inserting chill blocks at the points on the cams to provide a layer of chilled, white iron to resist wear. The depth of chill is regulated by varying the amounts of nickel and chromium in the alloy. The iron is superheated in the electric furnace.

♦ ♦ ♦

FOUNDRIES are using oxyacetylene blowpipe for dry blacking or smoking the surfaces of sand molds. The oxyacetylene jet is regulated to burn with little or no oxygen so that it gives off a considerable quantity of soot or carbon. A good smoking gives the mold a smooth finish and protects it from washing action of the molten metal.

♦ ♦ ♦

Experiments are being made on nitriding or other means of hardening malleable iron before annealing. One suggested use is in sandblast nozzles.

♦ ♦ ♦

A high tensile strength copper-zinc alloy used for specialty castings including large marine propellers has approximately the following composition: Copper, 50 per cent; zinc, 45 per cent; nickel, 2 to 2.25 per cent; iron 0.8 to 1 per cent; tin 0.5 per cent; manganese, 1.5 to 2 per cent. Castings of that metal give a tensile breaking strength of over 80,000 pounds per square inch.

♦ ♦ ♦

In a group of five gray iron foundrymen making light and medium work, an exchange of experience showed that every one of the group was melting in improvised small cupolas or at a reduced rate. All were using scrap exclusively with briquetted alloy additions.

♦ ♦ ♦

PRECIPITATION hardening process of beryllium-copper castings starts with an annealing and quenching treatment which places the beryllium in solid solution. Castings then are soft and easily machined. After machining, they are given a simple low temperature heat-treatment for a limited period at about 600 degrees Fahr. A 2½ per cent alloy having a tensile strength of 50,000 pounds per square inch in the quenched condition, will have a strength of from 110,000 to 12,000 pounds per square inch after the precipitation hardening treatment.

♦ ♦ ♦

Use of photoelectric equipment for sorting and inspecting is increasing rapidly. The equipment may be arranged to initiate control relays which will remove from the production line an object which does not meet specifications.

♦ ♦ ♦

An English manufacturer of piston rings is melting all iron used for single cast rings in crucibles.

♦ ♦ ♦

Due to the lining softening up with each ladle of iron, there is an increased tendency of the refining slag to adhere to the lining in traveling upward on the surface of the metal as the ladle is filled. This reacts with the lining, forming soda silicate slags which continue coming up the sides of the ladle and it is almost impossible to avoid some slag going in with the metal. With the use of a bottom-pour ladle, this difficulty may be avoided, although there still is danger of slag coming out with the last iron.

♦ ♦ ♦

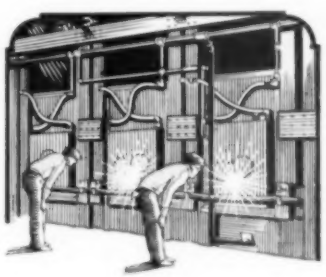
OVERCHILLING aluminum castings, although possibly increasing the soundness in the immediate chilled area, may destroy the ideal progressive solidification and cause unsoundness in other areas.

♦ ♦ ♦

A good material for packing malleable castings consists of air furnace slag which contains approximately 50 per cent silica and 15 per cent alumina. Mixing approximately 10 per cent or more of crushed fire brick with the slag will increase the refractoriness.

♦ ♦ ♦

A new method of polishing gray and malleable iron specimens for metallographic examination utilizes



jewelers rouge which consists of a rouge cast in a stearic acid base. Sufficient water is used to act only as a lubricant. It is claimed that this method eliminates any tendency of the graphite constituent to pull out.

♦ ♦ ♦

A large manufacturer of various forms of glass has adopted the practice of chromium plating its gray iron glass molds. It is said that when so plated the glass does not stick to the molds and that wear is reduced.

Reader's Comment

Interesting communications from readers of The Foundry

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Vitally Interested

TO THE EDITORS:

Your recent issues have carried something of vital interest to every steel foundry organization trying to operate or do business today.

The facts which you have published in the way of a plain statement of production conditions and operating losses, along with classification of prices should become fundamental in the minds of the buyers and the business men of the country, such that the general sentiment should be along one line only: We are in business for the welfare or benefit of this country, and no business can carry on without at least making a fair profit, and the country without business or manufacturing is doomed to return to the soil and cities will become graveyards.

I note your set of prices so far only include those of the larger or heavy tonnage buyers, such as rolling mill or steel works requirements. I trust it won't be long before you will be able to investigate the higher grade fields, which require 80 to 100 per cent finished castings under all forms of inspection, which naturally means greatly increased costs and very much higher prices.

An industry as large as the steel founders or producers certainly should have proper recognition in the trade, carrying classification of costs the same as produced by other large industries in the past. Such information, when properly carried out, spells stability for any industry.

RALPH H. WEST

West Steel Casting Co.
Cleveland, O.

Lack of Leadership

TO THE EDITORS:

The foundry industry lacks leadership. Secrecy and ignorance hide ability of such as may be qualified to lead. There are various organizations but little organization along business lines. There are standard trade practices but those which have been adopted, are observed more generally in the breach than otherwise. Foundrymen ordinarily greedy for tonnage are now desperate and the victims of their own fears. They are making all sorts of concessions and setting up no resistance whatever against unfair demands of buyers, silly offers of feeble-minded competitors, or other demoralizing conditions. They have done quite a super-excellent job of penny-pinching on costs, but have not yet shown sense, courage or ability on sales.

Advertising has been negligible, stereotyped, and ineffective, in so far as there has been any.

This is quite an indictment of a big industry which should have and use brains to solve its problems. What to do is the question!

Suggestions would be that:

(1)—Each present organization elect some real leaders or appoint some committee to study the business and sales sides of the whole industry and of all individual companies.

(2)—Study losses of tonnage, losses of cash out of the treasury, and losses of customers by one plant to another or to other products.

(3)—Study price trends and price methods.

(4)—Exceptional methods, if there are any, should be studied, copied and recommended to others.

(5)—Bad practices should be condemned and eliminated.

(6)—Sales budgets should be set up, and along with those—advertising budgets and plans.

This sort of survey and effort should cure foundry managements of the obsession that they must go on with ruinous price competition, and that the solution lies in seeking mass production and lower unit cost.

During the past month papers have reported sessions of bankers lasting far into the night. With all the troubles of foundrymen, no such sessions have been reported and most of the meetings which have been held, appear to have been mere luncheon engagements for social and entertainment purposes with only a limited time spent in consideration of routine or detail problems and almost no time spent on the big issue which confronts the industry.

Quoting from a business trade paper—

> There is an industrial problem to be solved, and an organization of competent thought is necessary. Let us suppose that a small group of 25, more or less, of outstanding industrial executives were unostentatiously to come together for the resolved purpose of focusing the best intelligence available upon the situation. A smaller group might be designated to take the brunt of the load. A few would find it necessary to cast their ordinary business routines entirely aside, just as certain dollar-a-year executives did to serve the government during the war.
>
> They might shut themselves in, so to speak, and do nothing but work on the industrial problem. They would take counsel of experts, economists, engineers, political authorities, bankers, agriculturists, labor leaders. Their objective would be to formulate a program of action to break through the stone wall of the industrial crisis and to re-establish the sale of their own product. Such a program would be one which industrialists everywhere could get behind.

The suggestion is respectfully submitted to your paper in the hope that you will see merit in the idea and that your readers may be aroused to the need for some action in each branch of the industry.

SMALL FOUNDRY OWNER

Burns the Lining

TO THE EDITORS:

In a recent issue of THE FOUNDRY I read an inquiry on why the cupola lining burns out on one side. In my experience with small cupolas from 16 to 30 inches diameter I have found that this form of trouble may be traced to one of two causes. In the first—and this applies particularly to the smaller diameter cupola—the charge sometimes hangs up. When this happens the blast is not absorbed by the coke and iron, but has free play across the empty space in the cupola. Usually the blast from one tuyere enters more freely than the blast from the others. The strong blast from one side directs a flame against the opposite side, and the result is a lining burned out at one side.

The second cause is similar to the first with the exception that it appears at the close of the heat, instead of at some period between the beginning and the end. If the blast is kept on at full volume after the last charge has been melted, the force and intensity of the flame will burn the lining to an appreciable extent. Where each tuyere is delivering an equal volume of air at uniform pressure, the lining of the cupola will burn away to a uniform depth all around. However, this condition rarely obtains, and as a result the strong blast from one side causes the lining to burn away on the opposite side. The usual remedy is to reduce the blast near the end of the heat. In a small cupola,

sometimes it is advisable to place an extra charge of iron in the cupola, and then shut off the blast just before this charge reaches the melting zone. Next day, of course, this iron is recovered from the dump.

In an emergency I have used a small home made 16-inch cupola, in which the blast was delivered by a 14-inch forge fan driven by a 3-horsepower motor. Have made hundreds of castings weighing up to 200 pounds. My first experience with a cupola was with one built of cast iron staves held together with wagon wheel tires. It was about 26 inches diameter, with two tuyeres, opposite each other, and certainly kept one man busy charging when running on stove plate.

Kirksville, Mo. W. L. SHERWOOD

Pour Metal Fast

TO THE EDITORS:

A reader in a recent issue of THE FOUNDRY inquires how to stop shrinkage in aluminum castings weighing from 35 to 90 pounds. In an experience of 4 years covering aluminum castings from 20 to 150 pounds we found that the following method prevented any shrinkage trouble: Whereever possible the casting was gated on both sides. Deep runners were cut in the cope and drag and several gates connected the runners with the casting. The metal was poured as fast as possible. For the second half of the four year period we used nothing in the charge but scrap metal.

Scranton, Pa. JOHN G. FRIEND

Keeping Posted

TO THE EDITORS:

Enclosed find postal money order for $2 for one year's subscription to THE FOUNDRY. Have been out of the business for a few years but unfortunately have been forced back into it again. A foundryman without the medium of keeping posted and up-to-date as to what is going on, is like a ship without a rudder. Have read THE FOUNDRY a great many years previous to being away from it for 10 years. Hoping that prosperity will soon return so everyone that wants to put their shoulder to the wheel and push may get a part of same, yours for future success.

Niles, Mich. EDWARD YOSS

Emblem of the Art

TO THE EDITOR:

As a matter of reader comment, I regret to note from your description of "Vulcan" on page 34 of the March issue, how sadly the foundry industry must be slipping when it was necessary to use sheet metal to replace the thumb of this statue which has stood for 29 years and failed only as a result of fastenings which held the thumb in place and which were not of cast metal.

I trust that should this replacement fail in less time than 29 years due to electrolytic action between unlike metals, that you will give at least as great a space to the failure as you have given to this wonderful repair job.

Should a failure occur in this replacement, I am sure that the entire foundry industry will be pleased to have this wonderful piece of work restored as an emblem of the art of casting.

E. A. BYERLEIN
General Manager.
Milwaukee Foundry Equipment Co., Milwaukee.

A. F. A. Nominates Officers and Directors

The nominating committee of the American Foundrymen's association recently met in Cleveland and nominated the following for officers and directors:

President, Frank J. Lanahan, president, Fort Pitt Malleable Iron Co., Pittsburgh.

Vice president, Dan M. Avey, Editor THE FOUNDRY, Cleveland.

Directors for the 3 year term: George Batty, technical director, Steel Castings Development bureau, Narberth, Pa.; T. S. Hammond, president, Whiting Corp., Harvey, Ill.; R. J. Teetor, general manager, Cadillac Malleable Iron Co., Cadillac, Mich.; R. F. Harrington, metallurgist, Hunt-Spiller Mfg. Co., Boston; and J. L. Wick Jr., president and general manager, Falcon Bronze Co., Youngstown, O.

Director for 1 year term: Dr. H. Ries, Cornell university, Ithaca, N. Y., technical director committee on molding sand research.

Action on the nominations will be taken at the annual business meeting during the convention in Chicago, June 20-23, and the newly elected officers and directors will be installed at a meeting of the board of directors to be held within 90 days after the close of the annual convention.

To Hold Convention

Twentieth National Foreign Trade convention will be held in Pittsburgh, April 26-28, under the sponsorship of the National Foreign Trade council.

Specification QQ-B-671 covering bronze and aluminum castings, recently has been promulgated by the Federal specifications board, Washington.

Pays Tribute To Foundry Doctors

In the recent death of William S. Shelow, metallurgist for the Semet-Solvay Co., Cincinnati, the foundry industry suffered the loss of one of these metallurgical geniuses who infrequently appear in the pig iron and coke trades and who freely give practical aid to foundrymen and other consumers occasionally bedevilled by especially intricate problems of the craft, according to J. F. Froggett in *Daily Metal Trade*. Born in Newport, Ky., he studied metallurgy in the East and for many years served as metallurgist for the American Pig Iron Warrant Co., New York. Later he served Eaton, Rhodes & Co., in Cincinnati in a similar capacity. For the past 10 years he has been connected with the Semet-Solvay Co. The foregoing is a mere skeleton of the full, active and helpful life of William S. Shelow who died March 21 at the age of 69.

Hundreds of foundrymen throughout the Middle West will learn with regret of his death. Passing by the door of the front office, the coke expert preferred to enter the shop or that part of it devoted to the melting process. He was equally at home with the superintendent, the melter or the molder and helped each one iron out his particular problem by freely sharing his vast store of practical knowledge and experience.

Eliot A. Kebler, a pig iron salesman for many years with Matthew Addy & Co., Cincinnati, and later with Fawcus Machine Co., Pittsburgh, occupied a similar position in the minds of a wide clientele of foundrymen. Kebler knew pig iron as Shelow knew coke. In the foundry he dispensed freely his wealth of metallurgical knowledge and assisted the perplexed foundryman in the practical application. Back files of the *Iron Trade Review*—now *Steel*— bear testimony to his throrough knowledge of his subject, grounded upon first hand information gained in intimate contact with the blast furnace. Following one of his hints or tips, the foundryman's troubles usually vanished.

George A. T. Long, formerly with Pickands Brown & Co., Chicago, and now with Pickands, Mather & Co., still is actively following his profession of foundry doctor or good Samaritan on the problem infested foundry road to Jericho. Where a hint or a bit of instruction is not sufficient, Long throws off his coat and personally prepares a mixture that will do the trick. Shelow, Kebler and Long are members of a comparatively small group of geniuses gifted with an uncanny intuition—to some extent the unconscious essence of long experience —which frequently permits them to lay their finger immediately on the sore spot and prescribe the necessary remedy.

Men of Industry

Whose Activities Are Making Foundry History

OTTO ABEL, for the past 8 years foundry superintendent, Sweet & Doyle Foundry & Machine Co., Troy, N. Y., has been made foundry superintendent, Riverside Foundry Co., Kalamazoo, Mich. Mr. Abel also has served as foundry superintendent of the following: Combustion Engineering Corp., East Chicago, Ind.; Lindahl Foundry & Machine Co., Chicago; Consolidated Machine Tool Corp. of America, Wilmington, Del., and the Bonnot Co., Canton, O.

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A. R. JOHNSON recently was elected president of the Sparta Foundry Co., Sparta, Mich. JOHN SCHUITEMA, H. G. VAUGH, D. W. ATKINSON and I. E. MCGOWAN were made vice presidents and LOU KELLER was elected secretary-treasurer.

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EVANS WOOLLEN, president, Fletcher Trust Co., Indianapolis, has been elected a director of the Link-Belt Co., Chicago. The following directors have been re-elected: GEORGE P. TORRENCE, president; ALFRED KAUFFMANN, vice president; and HENRY F. POPE, president, National Malleable & Steel Castings Co., Cleveland.

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E. P. BULLARD recently was elected president of the Bullard Co., Bridgeport, Conn. Other officers are as follows: Vice presidents, E. C. BULLARD, D. B. BULLARD and J. W. BRAY; secretary-treasurer, A. E. NORTH; and assistant secretary-treasurer, G. L. TODD. Directors E. P. BULLARD, E. C. BULLARD, D. B. BULLARD, J. W. BRAY, A. E. NORTH, E. P. BLANCHARD, H. C. BULLARD, J. W. C. BULLARD and T. E. DUNN.

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DR. LYMAN J. BRIGGS, acting director of the bureau of standards, Washington, since the death of Dr. George K. Burgess, last July, has been nominated for director of bureau. DR. BRIGGS is 58, has been with the government since 1896. He entered the bureau of standards in 1920, and became assistant director in 1927.

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FRANK A. TRUEL, superintendent, York Foundry & Machine Co., York, Pa., recently was made general superintendent of the pattern shop, brass foundry and iron foundry of that company. Mr. Truel also is a metallurgist and a graduate of McLain's System, Inc., Milwaukee. During a foundry career he has bee n superintendent, Municipal Foundries Inc., West Allis, Wis.; superintendent of the Neenah Foundry Co., Neenah, Wis., and superintendent Lakeside Foundry Corp., Milwaukee. The York foundry is a large producer of semisteel using from 30 to 100 per cent steel in the various melts.

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HENRY S. BEAL, recently was elected president, Sullivan Machinery Co., Chicago. Mr. Beal was born in Rockford, Ill., in 1888 and attended Dartmouth college and the University of Berlin. Since 1919 he has been connected with the Jones & Lamson Machine Co., Springfield, Vt., starting as a machinist, then becoming successively traveling demonstrator, manager of cost accounting, sales manager and general manager. Mr. Beal succeeds ARTHUR E. BLACKWOOD who has been elected chairman of the Board of Directors. Mr. Blackwood has been with the Sullivan Machinery Co. since 1897. Until 1919 he was manager of the New York City sales office. In the latter year he was made vice president in charge of finance and four years ago was elected president.

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KENNETH HEADLAM-MORLEY has been appointed secretary of the British Iron and Steel institute succeeding G. C. Lloyd, who will retire after 30 years service with the institute. Mr. Headlam-Morley was educated at Eton and Oxford and joined the staff of Dorman, Long & Co., Ltd., in 1925. After a technical training in the iron and steel works at Middlesborough, he was been occupied in their secretarial, managing director's and by-products departments. He has traveiled extensively in France and Germany and is well acquainted with the iron and steel industry of western Europe.

Considers Results Of Malleable Researches

The quarterly meeting of the Malleable Iron Research Institute, held at the Hotel Cleveland, Cleveland, March 29 considered results of a number of important research projects. Enrique Touceda, consulting engineer reported on the investigation of variation of carbon content at different intervals in pouring and recounted the progress of experiments on nitriding malleable iron under a new process. Application of this product and also malleable iron hardened under a salt bath and with heat treatment opens new uses in the wear resisting field.

President E. E. Griest, Chicago Railway Equipment Co., Chicago reported widened applications of malleable castings where cost, strength and corrosion resisting properties are important.

The secretary of the Institute, Robert F. Belt, presented three completed surveys covering production and selling problems. The price trends in malleable studied as to the railway, automotive, implement and general jobbing field were compared over a period of years with steel prices and various composite averages. The effect of variations in estimating weights of castings from blue prints for cost and price purposes was shown to exert a profound influence. Another report covered types and makes of wheels, speeds, inspection of speeds, guards, rests and other safety factors in operating grinding wheels in casting finishing.

T. M. Jorden, Stevenson, Jordan and Harrison, Cleveland, reported on the results of a survey conducted on rate setting procedure in member plants. This study which is based upon time required for various operations in castings production, gives a basis for wage remuneration. Ac-

tion was taken to utilize the services of the firm on the work of member plants.

The luncheon speaker, Russel Weisman, financial writer and instructor in economics, western Reserve university, spoke on the bank situation and probable remedies for credit shrinkage.

The recent decision of the U. S. Supreme Court in the Appalacian Corp. case involving the legality of group selling, was reviewed by Hubert B. Fuller, Cull, Fuller & Laughlin, Cleveland.

Estimating Again Features Discussion

Discussion of estimates made from blueprints again featured the regular meeting of the Malleable club held at the Hotel Blatz, Milwaukee, March 14. Twenty-two members attended the dinner and remained for the discussion. As a result of the activity in connection with making estimates from blueprints, a noticeable improvement is reported in ability of members to estimate casting weights from blueprints.

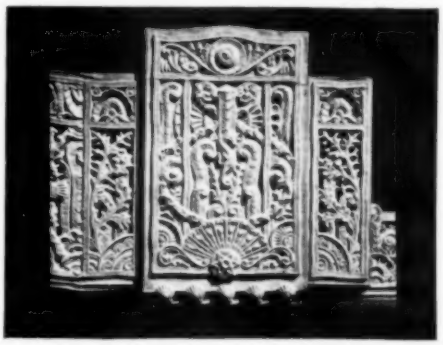
E. M. Hadley, Chain Belt Co., Milwaukee, presented a technical news report in which he called attention to a recent paper on the causes of speckled fracture. A number of interesting metallurgical problems also were discussed.

Prepares Film for Foundry Instruction

Department of practical mechanics, Purdue university, Lafayette, Ind., recently has completed a motion picture on foundry work which will be used in the administration of the foundry course at that institution. The picture was produced by R. E. Wendt, instructor in foundry, and C. C. Sigerfoos, and was photographed by Prof. Justus Rising of the department of mechanical drawing. The film shows the various steps in the production of a gas engine cylinder casting. Part I is devoted to dry sand core making and Part II illustrates the operations of molding, melting, electric furnace operation, pouring, cleaning and grinding. Approxnmately 45 minutes are required to show the film.

Castings Used on Marquee of Seattle Store

Nine tons of copper castings were used in the construction of the marquee of the large Bon Marche department store in Seattle, according to the *Bulletin* of the Copper & Brass Research association. The marquee extends completely around



Close view of the design on the marquee

the store. A view of the ornamental design used on the copper castings is shown in the accompanying illustration.

Gives Formula For Finding Molding Costs

"Light Machine Molding Costs" was the subject of a paper presented at the March 13 meeting of the Connecticut Nonferrous Foundrymen's association at the Hotel Garde, New Haven, Conn., by R. C. Miller, sales engineer in the New England territory, Osborn Mfg. Co., Cleveland. Mr. Miller directed attention to the effect of light machine molding on the general cost structure and offered numerous suggestions for a better control of that item of cost. Considerable discussion developed from the address, especially in connection with a formula for tabulating costs.

Book Review

Our Mineral Civilization, by Thomas T. Read, cloth, 165 pages, 5 x 7½ inches, published by the Williams & Wilkins Co., Baltimore, and supplied by THE FOUNDRY, Cleveland, for $1.00 and in Europe by the Penton Publishing Co., Ltd., Caxton House, Westminster, London, England.

This volume is one of the Century of Progress series, covering a variety of subjects. Under the heading "Modern Magic" the author discusses coal and its contribution to modern civilization. The important place occupied by petroleum in providing transportation by motor is pictured under "The Magic Carpet."

Progress made in the development of iron and steel for commercial use, and the highly important part that ferrous metals play in every line of activity today are pictured briefly in "The Skeleton of Modern Industry." This is followed by a discussion of "Vulcan's Three Sons," namely copper, lead and zinc. Information also is presented on stones, aluminum, tin, antimony, arsenic, mercury, manganese, chromium, vanadium, cadmium, zirconium, radium, helium, neon, fluorine, beryllium, selenium, tellurium, platinum, osmium, tantalum, cerium, and caesium.

The book is written in the popular style, intending to be entertaining as well as educational.

Specifications for Gray Iron Considered

Consideration of the A. S. T. M. tentative specifications for gray iron castings, A48-32T, featured the regular meeting of the Wisconsin Gray Iron Foundry group held at the Hotel Schroeder, Milwaukee, on March 15. R. S. MacPherran, Allis-Chalmers Mfg. Co., West Allis, Wis., presented the new committee's viewpoint regarding the new specifications. E. M. Hadley, Chain Belt Co., Milwaukee, discussed the specifications from the viewpoint of the foundry operator. A lively discussion followed and a number of members agreed to undertake tests for the purpose of securing data correlating the properties of the new bars.

Professor R. S. McCaffery, department of mining and metallurgy, University of Wisconsin, presided.

Casts Guns by Centrifugal Method

Centrifugal casting of guns was the subject of an interesting paper presented at the regular meeting of the New England Foundrymen's association held at the Engineer's club, Boston, March 8, by G. F. Jenks, Lieut. Colonel, ordinance department, Commanding Watertown Arsenal. A number of interesting and instructive illustrations were thrown on the screen to illustrate the talk.

Constituents of Iron

"The Constituents of Cast Iron" was the subject of a talk by E. G. Hill before the Pittsburgh Foundrymen's association's regular monthly meeting at the Ft. Pitt hotel, Pittsburgh, March 20. Mr. Hill has had several years experience in mining and recovery of nonferrous metals and at present is industrial fellow of the Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh. The April meeting of the group will be held on Monday evening, April 24, at the Connelley Trade school, Pittsburgh, instead of the usual third Monday in the month.

Prevent Losses with

Proper Gates and Risers

By PAT DWYER

THE period over which metal remains liquid in a feeding reservoir depends principally on three factors, form, volume and temperature. Even a limited experience in the foundry is sufficient to convince any observer that molten metal solidifies in certain forms more rapidly than in others. For example a given quantity of metal cast as a long bar or plate will assume a solid shape in a few seconds, where the same quantity of metal cast as a sphere or cube will remain liquid for as many minutes. Among the many possible shapes in which metal may be cast, the ball or sphere retains its heat the longest for any given quantity or weight of metal.

Again, as pointed out previously, the temperature of the metal must be taken into consideration. Manifestly any given size riser filled with hot metal, will fulfill the same function as a larger riser filled with metal that has lost temperature on its journey from the gate at the bottom of the mold.

Thin Film Appears

The height of the riser also is an important factor in properly feeding a heavy copper casting. The law of gravity draws the liquid metal down from the feeder, but static pressure is an important auxiliary in securing density of structure.

By observing the molten metal in a large copper feeder, the watcher will note a similar development to that found on the surface of metal in a ladle. A thin film or crust appears on the surface and this rapidly becomes thicker. In some instances this crust forms so rapidly that it remains entirely or almost entirely flat, instead of sinking in the center as it does under proper conditions. This feature is illustrated in Fig. 200 where the riser at the left developed a crust over the top and thus denied the casting the benefit of that much feeder metal. The feeder at the right was covered with charcoal and as a result the metal at the top solidified only after it had followed the remainder of the metal downward on its journey into the casting.

Strange as it may seem, comparatively few foundrymen take advantage of the fact that the metal in a covered riser will remain hot for a longer period than metal exposed to the atmosphere. Charcoal, coal dust or blacking constitute excellent covering materials. A covering of dried sand, either sharp sand or molding sand, will answer the same purpose. Ashes may be used, or for that matter any material that is a poor conductor of heat.

Cover the Feeders

COPPER solidifies rapidly, therefore it is essential that it should be poured rapidly and at a fairly high temperature into the mold. Large feeding risers are required over heavy sections and it is advisable to fill these risers with fresh, hot metal, rather than depend on the comparatively cool metal which has traveled all the way from the bottom of the mold and thus has lost considerable fluidity and temperature on the journey. Mysterious cracks in castings occasionally may be traced to the metal instead of the molding or gating features. Although the crucible, the open flame and the electric furnace are preferable for melting copper, the cupola may be employed in an emergency provided proper precautions are observed to prevent contamination and oxidization. Charcoal between the charges and a low blast are recommended.

Copper Freezes Rapidly

Rapidity with which molten copper solidifies on all exposed surfaces limits the amount of metal available for feeding purposes. This characteristic also is responsible occasionally for cleavage zones around the base of the feeder, extending into the casting. This type of defect, the cause and the remedy, are illustrated in Fig. 201.

The base of the feeder is enlarged to cover approximately 80 per cent of the surface on which it rests. The short neck does not interfere with the passage of the metal in the large reservoir above. A long, narrow neck will reduce the efficacy and in some instances will entirely nullify the benefit of any feeder.

The casting shown in Fig. 203 is typical of a large class susceptible to the treacherous behavior of copper while passing from the molten to the solid state. In this type of casting two heavy or bulky parts are joined by a lighter section. Where attempt is made to feed the casting through a single feeder on the part *R*, the result will be a cavity or series of small cavities in the boss as shown. To overcome this form of defect it is necessary to place a second feeder on the casting in the position shown by the dotted line marked *B*.

Limited scope of the efficacy of any riser was shown by experience in casting a solid copper bar 36 inches in length and 8 inches square in cross section. A large feeder at each end was not sufficient to prevent shrinkage in the center. Four large risers spaced equidistantly were required to insure a solid bar.

Consider Temperature

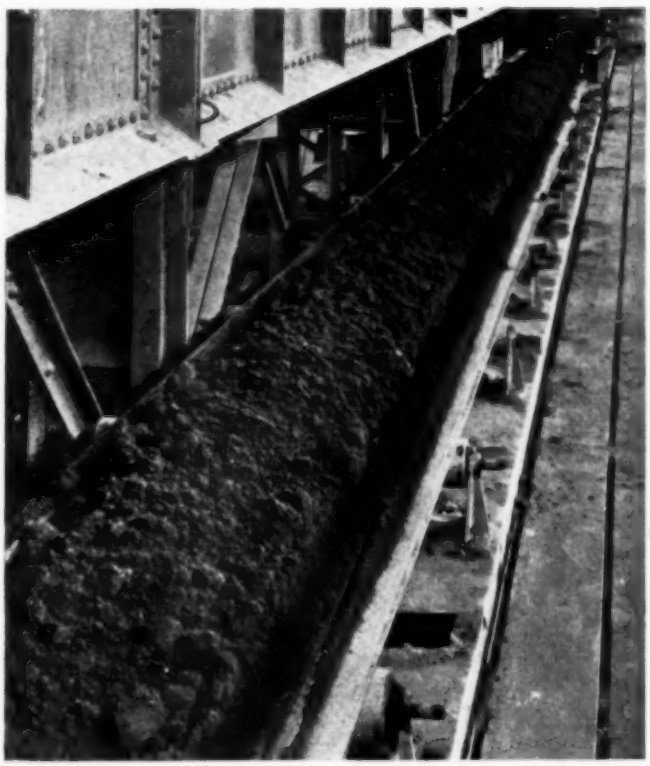
Assuming that the metal is skimmed clean, that the sprues and gates are designed and placed properly and that the feeders, ample in size, are located in the most advantageous position, two other factors require attention. These are the condition of the metal in general and the pouring temperature. Unless the copper is melted under intelligent metallurgical supervision it will absorb gas. Some of this gas is forced out during the solidification process, but a sufficient amount will remain to produce the honeycomb structure found in defective castings. Presence of gas in detrimental quantity is indicated by the behavior of the metal in the sprue and feeders. The metal instead of sinking quietly as solidification progresses, becomes puffed up, a condition referred to in the foundry as a *cabbage head*. In the extreme instances the gas expands and forces some of the metal to flow over the tops of the risers.

A discussion of the metallurgical principles responsible for the phenomenon lead too far afield under present conditions. For all practical purpose it is sufficient to say that the condition of the metal in the casting

(Continued on Page 34)

Smith may have you
LICKED ON QUALITY

IT'S easy to get the notion that price is beating you on every job that you lose. Certainly price is an important factor, but the buyer of castings still wants top quality. And when you lose an order to Smith he may be getting more than you ask, simply because he delivers better quality.



The most expert hand methods cannot approach the uniformity of the stream of machine conditioned sand that is moving along this belt conveyor. Perfect control of sand goes a long way towards castings of top quality. Besides, machines prepare sand at a fraction of the cost of hand methods and thus you get not only better castings, but also a price edge.

While many things go towards better castings, sand is of vital importance. No two molders make the same mix, and that's where you really start to make or break quality. The old time molder who had the feel of things has passed out of the picture. The man you depend on now must be given the right sand mix or you don't get top quality.

This problem has a simple answer. To get good sand and keep it coming right, requires sand handling equipment. This doesn't mean that it must be elaborate, expensive stuff. There are new ways and methods to meet today's conditions. Equip one spot in your foundry at a time . . . put in only the essentials . . . and you get by so that the saving in production costs usually pays for the equipment as you go along. When you get through you will have adequate sand control. Competitor Smith will never again lick you on quality so far as sand has any influence.

Bartlett-Snow is ready with concrete ideas on simple sand handling equipment that doesn't run into much money and pays for itself in short order. Our representative will be glad to visit your plant whenever you like, to make a check-up with you. Write today for complete information.

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BARTLETT-SNOW

SAND HANDLING AND MOLD CARRYING EQUIPMENT

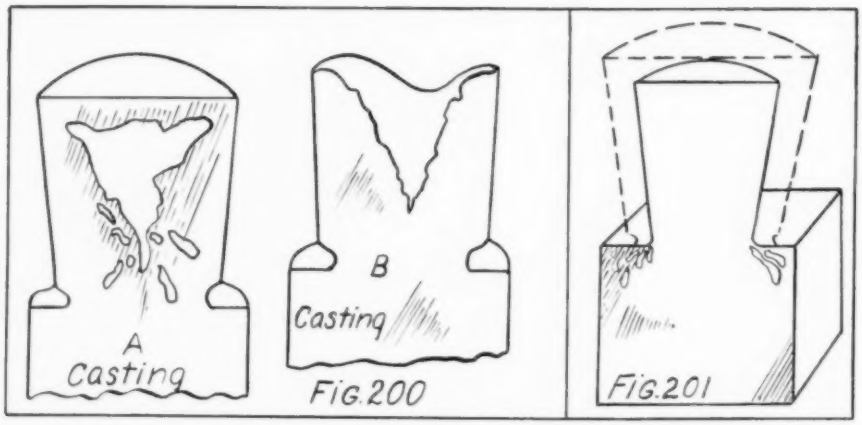


Fig. 200—Riser at the left was left open while riser at the right was covered with charcoal. Fig. 201—Faulty riser leaves cleavage planes in casting

depends on the melting practice and on any subsequent addition of deoxidizing elements to the metal.

In some instances defects in the castings can be traced back to the virgin copper, but these instances are of rare occurrence and serve merely to prove the truth of the old saying that exceptions prove the rule. A typical instance where cracked castings were traced back to the original metal will be taken up later.

In general it may be said that copper is melted most satisfactorily under charcoal. After the metal has attained the proper pouring temperature, it should be poured immediately. Extremes in pouring temperature are to be avoided. Hot metal will burn the face of the mold and produce rough castings. Cold metal may result in cold shuts or missruns. Of the two evils the second is the greater and for that reason the metal should be poured at a temperature nearer the top than the bottom of the scale on the pouring range.

Deoxidizing Copper

Practical foundrymen interested more in practical application than in scientific explanation will hearken to the following observations of R. R. Clarke (THE FOUNDRY, March 1, 1928) touching on the subject of deoxidizing copper:

Deoxidizing elements often are added to copper. I have seen silicon, magnesium, zinc and phosphorus employed at different times. I also have made copper castings treated with boron suboxide. Of all remedies I believe I have noticed best results where a small amount of—approximately 2 per cent—zinc and just a pinch of phosphorus were used.

High electrical conductivity often is a required condition of copper casting. The zinc and phosphorus insure soundness of metal, but are said to interfere with the electrical conductivity. For that reason I have employed silicon, magnesium or boron suboxide to promote fluidity in the molten metal and solidity in the casting. Whether these elements are greater promoters of conductivity, I cannot say from personal knowledge. However, so far as the production of good, sound castings is concerned I have found nothing as trustworthy as the zinc-phosphorus combination.

Foundrymen occasionally are inclined to blame the gating system for defective castings when in reality some rare or remote cause is responsible. A typical instance of this kind is described by Alfred F. Stoney in the April 1, 1930 issue of THE FOUNDRY.

We make a great many copper castings, tuyeres, coolers and cooling plates for open-hearth and blast furnaces. These castings vary in weight from 110 to 700 pounds. The lighter castings are made in green sand while the heavier castings are made in dry sand molds. The castings are poured from electrolytic copper melted in an open flame furnace burning by-product coke gas. A deoxidizer to the amount of 0.5 per cent tin and the same amount of phosphorus is added to the metal in the ladle.

Occasionaly these castings cracked. In some instances the cracks were no wider than hairs. In others the castings were ready to fall apart. The molten metal came from the furnace in good shape and showed no sign of oxidation. Experienced men on the same job for years melted the metal, made the cores and molds. Extensive investigation showed that cracked castings coincided with the arrival of a new car of copper and ceased when that particular lot of copper was exhausted. Further inquiry revealed that it is customary in copper refineries to stir the copper with a green hickory pole. If the process is carried too far the metal becomes over poled. This seems to shorten the grain and as a result the copper cracks more easily. Laboratory examination of the defective castings did not definitely saddle the blame on over poling, but having eliminated every other possible source which might contribute to the defect, I am satisfied that is the cause.

In concluding this brass, bronze and copper section of the series of articles on gates and risers it may be pertinent to refer briefly to the practice or feasibility of melting these metals in the cupola. Usually these are emergency jobs or jobs undertaken as an accommodation by the operators of gray iron foundries where the cupola is the usual melting medium. Lack of success in the production of perfect casting in several instances has created a somewhat adverse sentiment. Curiously enough this opinion is held by some men who never tried to melt copper or bronze in the cupola. This despite the fact that successful manipulation of the cupola on copper and bronze heats has been practiced for many years and has been described in THE FOUNDRY on several occasions.

Poured Heavy Castings

Data for one of the most interesting of these descriptions was supplied several years ago by the late T. F. Jennings at that time in charge of the foundry of the Utah Copper Co., Garfield, Utah.

Difficulty experienced and unsatisfactory results obtained by many foundrymen in the production of copper castings, particularly during the war period, created a certain prejudice against the metal which is entirely unjustified. Copper castings can be produced just as easily and readi-

(*Continued on Page* 36)

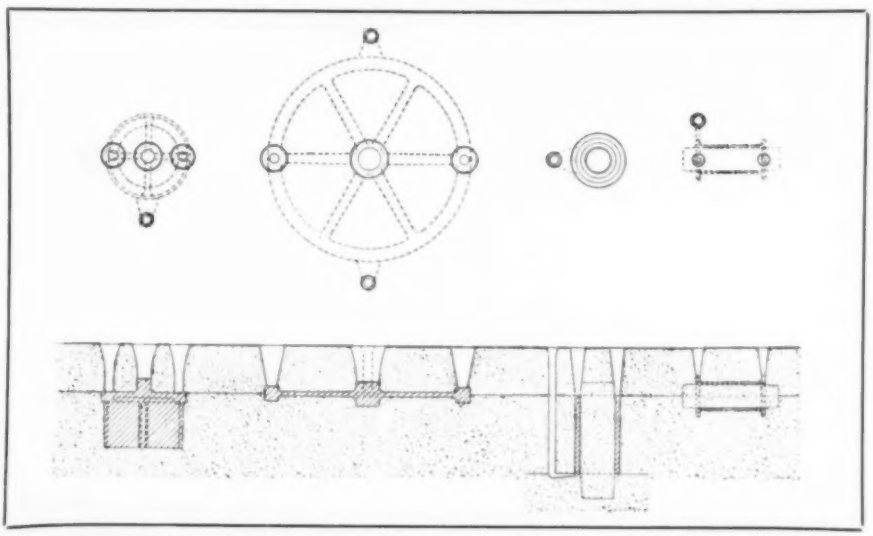


Fig. 202—Typical methods of placing gates and risers on monel metal castings

TABOR

TRADE 1884 MARK

CANTILEVER JAR SQUEEZER

Open on three sides for convenient handling of flasks

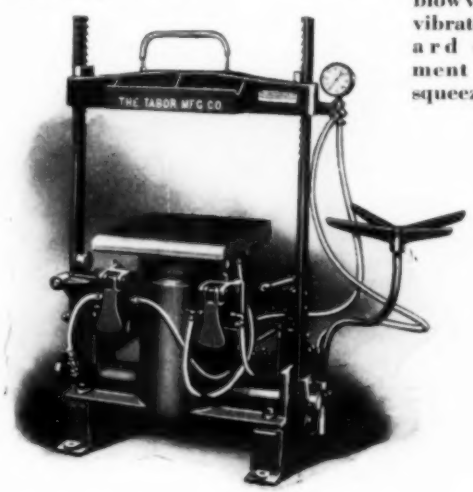
This squeezer has been built for "snap" work to round out the otherwise complete TABOR Power Squeezer Line. It is *sand-proof*. The cantilever yoke feature of this new 10″ squeezer provides ease of operation and a rigidity that ensures accurate molds. The TABOR yoke *will remain rigid*, and the ramming block is readily adjustable. Made either plain squeeze or jar squeeze, stationary and portable (22″ wheel spread). This is the ideal machine for rapid, low cost, accurate production.

SPECIFICATIONS

Table	18″ x 18″
Diam. Squeeze Cylinder . .	10″
Diam. Jar Cylinder	4″
Width over wheels	22″
Space needed behind machine to accommodate swing yoke .	26″

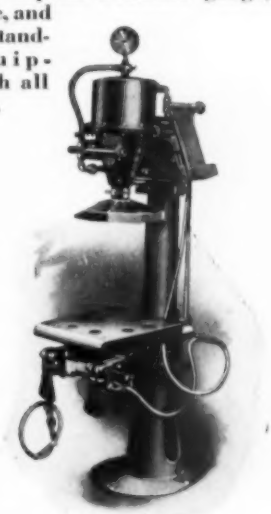
Yoke Jar Squeezer

This 10″ Jar Squeezer stands out for uniformity of squeeze and ease of operation. The large diameter squeezing cylinder exerts a steady squeezing pressure to pack sand to the correct density throughout the mold. Unusually long and carefully fitted pistons prevent wobbling and assure a long life of accurate molds. Made either plain squeeze or jar squeeze, in 10″, 13″ and 16″ cylinder; also furnished portable.



Post Jar Squeezer

The TABOR 10″ Post Squeezer was built to fill a general demand for a low priced, light weight, fast, machine with overhead squeeze cylinder. Made in power squeeze and jar squeeze; and with two types of portable bases: one for moving parallel to the sand heap and the other with 22″ clearance under the frame with a wheel spread of 72″ for straddling the sand. Table 16″ wide x 19″ deep. Adjusted easily and quickly for varying flask depths. Pressure gauge, blow valve, and vibrator standard equipment with all squeezers.



Dust Arrestor—, Core Room—, Tumbling Barrel and Brass Founders' equipment; Sand Blast Machinery, Cupolas and accessories, Ladles, tools, etc. Repair and replacement parts carried in stock for the "Paxson Line." Special machines designed and built. Inquiries welcomed.

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ly as castings of iron or any other metal if certain fundamental features peculiar to the metal while in a molten state, are considered. For acid resistance the metal in many instances is more suitable than iron.

Sponginess, blow holes, porous or unsound castings, cold shuts and shrinkage, are the usual causes of rejection of copper castings. Occasionally castings containing one or more of these defects may be used. As a general rule they are unfit for practical use and if their true character is not discovered before they are placed in service, they may cause trouble, expensive delays and perhaps accident.

Pores or blow holes in castings sometimes are caused by wet or hard molds or cores, but the principal cause lies in the metal itself, or

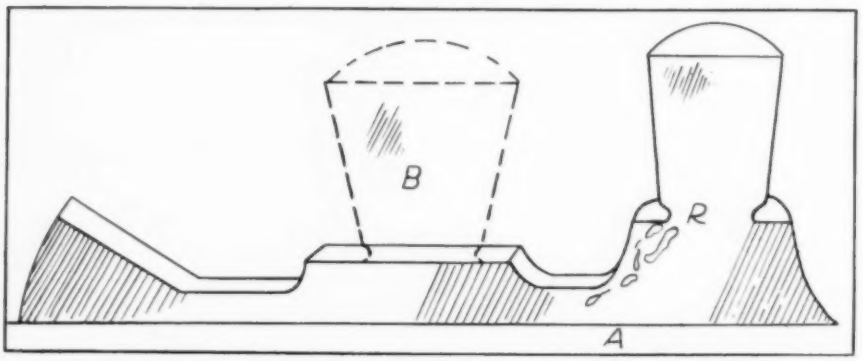


Fig. 203—Without a feeder at B the metal is drawn from under feeder R

rather in the method adopted while melting and pouring it. In this connection the methods adopted for making the large copper casting in the foundry of the Arthur plant of the Utah Copper Co., Garfield, Utah, will prove of interest.

The order included 33 copper and 6 large bronze castings having a total weight of 140,000 pounds. Several individual castings weighed 4400 pounds each. The resources of the purchasing department were tested in collecting enough scrap copper in the mountains and Pacific coast area to fill this order. Incidentally the castings were used in the construction of mills designed to extract copper from a very low grade ore by a new process. It is claimed that the result was 40 per cent better than anticipated.

The metal for several castings was melted in the orthodox manner in an open flame oil fired furnace. However, 21 castings required metal beyond the melting capacity of this furnace and recourse was had to a small cupola with a melting capacity of 3 tons per hour. A layer of charcoal was charged on top of the coke bed and another layer of charcoal was placed on top of each 1250-pound charge of metal. The blast pressure was about half that used on an iron heat.

Before the metal was tapped, the ladle was heated with a torch and a small quantity of calcium chloride was placed in the bottom. A generous layer of charcoal also was placed in the bottom of the ladle before the metal was tapped into it. Metal for the first three casings was deoxidized by small quantities of tin, zinc and boron product. Metal for the remainder of the castings was deoxidized by the addition of 1.00 per cent phosphor-copper in the ladle.

A handful of dry sand thrown on the slag in the vicinity of the ladle lip served as a skimmer and held all floating material in check. The stream of metal from the ladle was reduced before the risers were filled. The runner then was stopped and after a small piece of phosphor-copper had been dropped into each of the six large feeders, the remainder of the space in these feeders was filled with hot metal direct from the ladle.

Only brief reference can be made here to the gates and risers employed in molding monel and other high nickel content castings. The general practice resembles that pursued in the production of steel castings, but so many other factors exert a bearing on the problem, that a description of the gates and risers by themselves would not be a sufficient guide for a person venturing into this high melting point field. The subject of monel metal and nickel foundry practice is covered in a paper presented by E. S. Wheeler before the February 1930 meeting of the American Institute of Mining and Metallurgical Engineers. This paper was abstracted and presented in THE FOUNDRY Data Sheets No. 820-824, July 1, July 15 and Aug. 1, 1930. The following quotation indicates the scope of the paper and also shows the necessity of reading it in full, if the student wishes to benefit by a description of the methods and materials employed at the plant of the International Nickel Co., Inc., Bayonne, N. J., over a period of 20 years:

Successful production of monel metal and nickel castings requires careful attention to the molding practice, proper melting equipment and the application of a definite deoxidizing and desulphurizing treatment. Numerous troubles encountered in initial attempts are due to lack of appreciation of these essential factors.

Shrinkage of monel and nickel is ¼-inch to the foot, the same as steel and approximately double that of cast iron. High shrinkage coupled with tenderness slightly below the solidus, characteristic of these metals involves adequate feeding of the casting and special precautions in molding to prevent shrinkage cavities and pulls. High pouring temperature demands the use of a highly refractory sand which will not wash or cut. Many foundries adequately equipped for brass and bronze have failed in attempts to produce satisfactory monel metal castings. The cause of the failure has not been the metal, but in the impotent materials and equipment. Typical methods for placing gates and risers on monel castings are shown in the accompanying illustration Fig. 202.

This is the fortieth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The forty-first instalment will appear in an early issue.—THE EDITORS.

Philadelphia Group Meets

Operation and application of the sandslinging machine was described at the regular meeting of the Philadelphia Foundrymen's association held March 8 at the Manufacturers & Bankers club, Philadelphia. E. L. Mitchell, demonstration engineer, Beardsley & Pipe Co., Baltimore, discussed the subject from various angles and illustrated his talk with motion pictures.

J. B. Greenstreet, president of the association, presided.

Made Vice President

William P. Woodside has been elected vice president in charge of research, Climax Molybdenum Co., Detroit. Mr. Woodside, who has been identified with the company in a consulting capacity since 1926, previously was manager of materials and standards department, Studebaker Corp., South Bend, and with the sales department of the Crucible Steel Co. of America. He also is vice president of the Climax Molybdenum Co. of Michigan. He is one of the two surviving members of the group of three founders of the American Society for Steel Treating.

Controls Temperatures

Lucius Pitkin, Inc., 47 Fulton street, New York, has developed a simple but sensitive temperature control unit which employs a new principle of operation. The unit, which is portable, functions without a standard voltage cell. It may be set up easily for temporary operation on any furnace, and has no motor or moving elements.

Builds Engines for 100 Years

Cooper-Bessemer Corp., with main office at Mt. Vernon, O., marks century of operation

THE Cooper-Bessemer Corp., with head office in Mt. Vernon, O., and plants at Mt. Vernon, O., and Grove City, Pa., marks the centenary of its founding —a hundred years of continuous activity and growth—in this present year.

In the fall of 1833 when the Ohio still was regarded as a far western river, if not the actual frontier of civilization, two brothers, Charles and Elias Cooper built a little foundry in Mt. Vernon, O. and ran off 500-pound heats of stove parts and plow points. The brothers had been raised on a farm, but upon attaining their majority decided to make a cast for a living in a wider field than that provided by the few parental acres. In their first effort they opened a small mine and tried to sell coal. Among a people accustomed to burn wood and in a territory where wood was cheap and plentiful, their efforts neither were appreciated nor rewarded.

Men Must Have Castings

However, young Charles Cooper had the instincts of a trader, rather than those of a farmer and these in addition to the natural pride of youth which fiercely refused to admit defeat in the first venture, prevented him from returning to the farm. Adversity seemingly had the effect of raising his steam pressure. He argued shrewdly enough that people might do without coal, but certainly they could not get along without cooking utensils and agricultural implements. These things and many others, essential even in these early days, were products of the foundry. He decided to become a foundry proprietor.

What perhaps is more to the point, he succeeded to an extent of which he never had dreamed. Elias died in 1848. Charles, who appears to have been the dominating figure all the way, constantly expanded the plant and the scope of his activities until he became recognized as one of the leading engine builders of the country.

At various times the name of the firm was changed slightly to correspond with changes in personnel of those associated with the founder in the guidance of its destinies. The business was incorporated in 1895 as the C. & G. Cooper Co., and was operated under that title until 1929 when the Bessemer Gas Engine Co., Grove City, Pa., was acquired and the company became known as the Cooper-Bessemer Corp.

During the period of its existence the plan and organization which Charles Cooper founded have been responsible in large measure for many refinements in application of steam power in practically every form of prime mover. Beginning with a plain little slide valve steam engine in 1840 the company has kept pace and in some instances set the pace in the development of many types of engines, stationary and marine.

The first blowing engines were built in 1852 and installed at the various charcoal blast furnaces in central Ohio and in Hanging Rock district. Many of these engines were adapted to other uses when the furnaces were abandoned. One was in constant use at the Jefferson Iron Co.'s property at Oak Hill, O., for 63 years, from 1854 to 1917 when the stack finally was blown out. A brief description of the first crudely built engine furnishes interesting contrast to the lofty vertical engines built later, before the blast furnace industry turned to the gas engine and the turbo blower. The old engine had one steam and two air cylinders. The 18 x 72-inch steam cylinder was connected by crosshead and iron bound wood connecting rod to the main shaft which drove two 48 x 72-inch air cylinders through a gear and pinion. The engine was bolted to heavy timbers resting on the ground. At 22 revolutions per minute and 60 pounds steam pressure the engine developed 90 horsepower.

Shortly after George H. Corliss was granted a patent on the rotary valve and automatic releasing gear, the C. & G. Cooper Co., commenced to build corliss engines for distribution in the Middle West. Eventually the line included simple engines in sizes from 25 to 5000 horsepower and compound engines, cross and tandem type from 25 to 12,000 horsepower. A special heavy duty mill engine also was developed and in addition the company extended its activities to the extent of designing and installing power transmission machinery.

Pioneered Gas Engines

The company was one of the earliest in the field of gas engine design and construction and has equipped hundreds of gas and oil pumping stations with engines in various sizes. The company also is identified prominently with diesel engine construction and gas producer equipment. The first steam locomotive constructed west of the Alleghenies was built by this company about 1850 and delivered to the Baltimore & Ohio railroad. It was followed by others of the same type. Periodic panics threatened the expanding company, but the Coopers issued scrip in lieu of money and it was honored through central Ohio.

About the turn of the century the Bessemer Gas Engine Co., Grove City, Pa., was beginning to supply clutches for engines in the oil fields and thereafter the two companies grew along similar lines. Officers of both companies realized the importance and commercial value of natural gas and recognized the increasing use of gasoline. In 1908 the Cooper Co., designed and built what at that time was regarded as a marvelous gas engine of 1000 horsepower. The company also was instrumental in designing the great compressors used on natural gas lines and economical batteries of power units operating on raw fuel for extracting crude oil from deep wells.

The two companies prospered through the following decades. The Bessemer company was capitalized at $3,000,000 in 1923 and had grown to such a size that it occupied 29 buildings. The Cooper company entered the diesel engine field in 1925 and secured manufacturing licences for the famous German M A N design. Both companies had so paral-

leled their activities in 1929 that a merger was organized under the present title Cooper-Bessemer Corp., a business now valued at $8,000,000.

During the past decade the company has built some of the largest diesel engines for marine service. Among these are included 3000-horsepower engines for the private yachts HI-ESMARO, owned by H. E. Manville; ALDER, owned by Mrs. W. B. Thompson and CAROLINE owned by Eldridge R. Johnson.

Despite adverse business conditions the latest report of B. B. Williams, president, shows that the company was flexible enough to enhance its cash position steadily since 1930.

Museum Shows Products of the Foundry

New York Museum of Science and Industry, Forty-Second street, New York, occupying 30,000 square feet of space in the Grand Central district, exemplifies the history, progress and present status of industry. It has been developed as an educational museum and enjoys a large and steadily increasing attendance.

Through activity of the American Foundrymen's association a foundry exhibit has been established in the section devoted to machine shop and foundry matters. The accompanying illustration shows the exhibit in its present stage.

Exhibits which have been loaned or presented by such firms as General Electric Co., Westinghouse Air Brake Co., Union Mfg. Co., Chevrolet Motor Co., Brown & Sharpe Mfg. Co., Whiting Corp., Ajax Metal Co., Crane Co., Allis Chalmers Mfg. Co. and others, cover a range of foundry equipment and products. These include various patterns, typical molds, ancient and modern castings and foundry equipment including a sectioned and lighted model of a cupola. Prof. J. W. Roe is in charge of the exhibit.

Light Reflecting Properties of Paint

A series of tests recently was conducted by the research division of the New Jersey Zinc Co., 160 Front street, New York, to determine the value of various paint colors to lighting. A room was painted one color, lighted with a definite wattage of electricity and ratings taken of the number of foot candles of light received on a table of working height. Duplicate rooms then were painted other colors and ratings were taken. In all, ten rooms were painted, the walls and ceilings being coated with the following: magnesium oxide; white paint; yellow paint; green paint; gray paint; pink paint; silver mirror finish; metallic paint or rough walls; metallic paint on smooth walls; and black paint. Although unsuitable as a paint pigment, magnesium oxide's whiteness—its light reflection value—is 98 per cent, the highest known. Therefore, that was used as a standard for judging the comparative value of the various colors.

Each of the ten rooms was lighted with a constant amount of indirect light and the amount of resulting light at the working level noted. Then each of the ten rooms again was lighted with a constant amount of semi-indirect light and the resulting light at the working level noted. The third test provided the rooms with a constant amount of direct light, and tests also were conducted with the same series of rooms to determine the values of paint colors as an aid to natural daylight illumination.

With indirect lighting, all light was reflected from the ceiling and upper side walls. It was found that the white room was 67 per cent more efficient than the one painted yellow, 78 per cent more than the one painted green and 89 per cent more efficient than the room painted gray. The white room provided the worker with almost twice as much light at the same cost. If less light was required by the worker, a much lower candle-power lamp could be used in the white room and a resulting lower number of kilowatt hours used, thus resulting in a considerable saving.

In the semiindirect lighting test, the light was enclosed in a translucent glass bowl reflecting most of the light to the ceiling and side walls but allowing some of it to come directly through a reflector and on the table. Naturally more light reached the center of the table than elsewhere, the amount of light decreasing toward the end of the table. It was found in this test that about the following rating applied to the reflective ability of the paint: 1, white; 2, yellow; 3, green; 4, gray. In the direct lighting test, all light was reflected directly on the table. In this test the range in light from the center of the table to the end was much greater, but even in this connection, where only a small part of the reflection value of the walls and ceiling is used, it was found that the order remained the same as in the semiindirect test.

In the natural illumination test, the light was admitted from a window and readings were taken on the table at the same spot as in the previous test. Naturally the light decreased as it approached the further end of the table. The order of reflection remained the same and where the center of the table was taken as a guide, it was found that white was 40 per cent more efficient than yellow, 39 per cent more efficient than green, 52 per cent more efficient than gray, and 191 per cent more efficient than black.

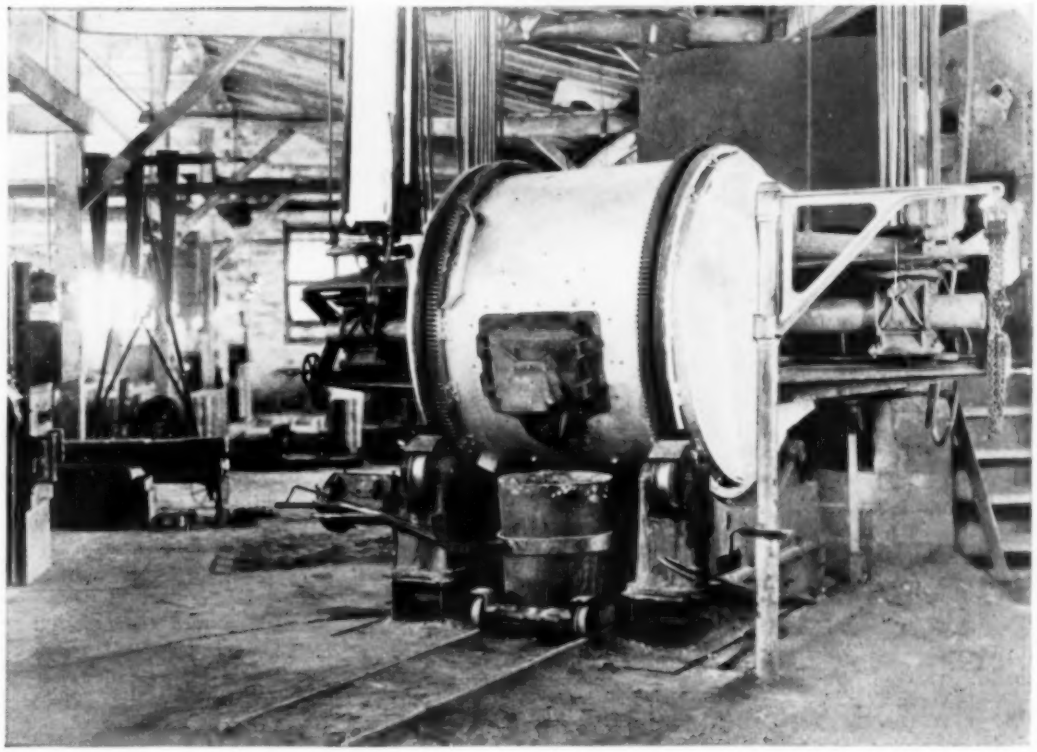
The data secured from the tests were presented in a paper "The Influence of the Reflecting Characteristics of Wall Paint on the Intensity and Distribution of Artificial and Natural Illumination," by D. L. Gamble, research division, New Jersey Zinc Co., and was presented at the annual meeting of the Society of Illuminating Engineers.

A part of the foundry exhibit which has been established at the New York Museum of Science

American industry played an important part in the general decline of accidents throughout the United States last year. There were about 15,000 industrial deaths in 1932, a reduction of 14 per cent from the 1931 total of 17,500. Accidental deaths from all causes and in all fields were reduced slightly more than 9 per cent last year.

DETROIT
ROCKING ELECTRIC
FURNACES

QUALITY CONTROL



SPEED ECONOMY

A Precision Melting Machine for Gray Iron, Alloy Iron, Malleable and Stainless Steels or Alloy Steel

These furnaces are used by many prominent concerns in the production of high quality castings, showing absolute control of analysis, high economy and excellent uniformity.

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DETROIT ELECTRIC FURNACE COMPANY

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Gray Iron to Specifications

(*Concluded from Page* 12)

difficult service conditions being imposed. Most of these castings call for iron of low carbon content or a special composition to produce high strength, wear resistance or other specific improvements in physical properties.

An important development is the replacement of the forged steel cam shaft with electric furnace iron. The firm has made many cam shafts, one of which is shown in Fig. 4, cast in permanent molds of electric furnace metal. Higher strength shafts of great rigidity are produced, having excellent wear-resistance properties and which are giving thoroughly satisfactory performance in service.

While extremely high tensile strength is not necessary for cam shaft service, tests show values well over 50,000 pounds per square inch. Of great importance, in addition to wear-resistance, is the fatigue endurance limit and in this respect the cam shafts made by the Eaton-Erb company have shown superior characteristics in service.

High strength gear blanks of excellent machineability also are made. These gears have a tensile strength in excess of 50,000 pounds per square inch and show exceptional wear-resistance. Tests on a recent shipment of these gear blanks for automotive work gave the following physical properties: Transverse strength (18-inch centers)—3300 pounds, deflection—0.30-inch, and tensile strength —52,500 pounds per square inch.

Special manifold castings are being made of carbon controlled electric furnace iron containing a small percentage of alloy. Much trouble previously was encountered by the customer due to cracking in service. Control of the carbon content and superheating in the electric furnace has resulted in a strong, fine-grained iron with complete elimination of the cracking tendency.

Foundry Talent To Star in New Play

A complete four-act play presented by a distinguished cast of 20, all identified with the foundry industry, will be presented Tuesday afternoon, June 20, at the Hotel Stevens, Chicago. This play, "Rebuilding For Profit," dramatizes in stirring fashion the trials and tribulations of a foundry under present-day conditions. Some of the leading talent of the American Foundrymen's association has been active in writing and preparing to stage the drama which will be sponsored by the cost committee of the American Foundrymen's association of which J. L. Wick, Falcon Bronze Co., Youngstown, is chairman.

Standard Samples Listed in New Bulletin

The analysis and price of available standard samples are contained in supplement to Circular No. 398 recently published by the department of commerce, bureau of standards. Available standard samples of interest to the foundry industry include seven types of plain and alloyed cast irons, numerous types of plain and alloyed steels, bronze bearing metals, manganese bronze, phosphor bronze, aluminum, zinc, copper, lead, and a variety of ferroalloys. The supplement replaces that issued Jan. 15, 1931.

Furthers Safety By Study of Accidents

Experience is the best teacher in furthering accident prevention. Among drivers, experience records previously mentioned in this series on the training of drivers, must not only be kept but used. Accident reports should be studied individually, at the time of, or immediately after the accident occurrs, to determine the causes, apply corrections to prevent reoccurrence of like accidents, and penalize the driver if a chronic offender. Summarized records for a period also should be analyzed to see what kinds of accidents are most frequent and what action the management should take.

Accidents should be classified as to kind or cause, the driver's age and experience, time of day, weather conditions, location—congested district or open country, and type of vehicle involved. Study of accident classification brings out the prevalent types, often indicating dangerous practices that can be stopped. It also affords information for educational programs and may reveal weaknesses in the management policy.

A policy is most unjust that has no other provision for handling the accident-prone than dismissal. More than that it is a short-sighted policy. When drivers plainly are found to be accident-prone they should be studied by experts to discover whether they have physical defects such as faulty sight, slow reaction, deafness, etc. If the troubles are correctible that should be attended to, otherwise such drivers should be given other work where these handicaps are not dangerous, or they should be dismissed altogether.

That management is remiss that does not recognize and accept its share of responsibility. The executive's first duty is to analyze his own set-up to see how far he may be to blame for the bad records of his drivers. Is he failing to keep his equipment in safe condition? Is he negligent in the matter of instructions and rules? Is he imposing unreasonable working requirements on his drivers—such as, too long hours, too rapid schedules, too heavy a day's work. In short, does he expect more from each driver than can be accomplished with due regard to safety?

A safety committee, council or court, is helpful in an accident-prevention and driver-training program. Such a committee should review all accidents but need not summon the driver for questioning unless the accident involves personal injuries, serious property damage, or the report indicates violation of the law, safety rules and regulations, or other instructions.

Quad City Group Probes Cupola Problems

Cupola construction and operation featured the regular meeting of the Quad-City Foundrymen's association held March 20 at the Fort Armstrong hotel, Rock Island, Ill. Charles F. Scherer, Davenport Machine & Foundry Co., Davenport, Iowa, and president of the association, presided.

P. T. Bancroft, foundry superintendent, John Deere Harvester Works, East Moline, Ill., spoke on cupola construction. Garnet Phillips, chief metallurgist, Frank Foundries Corp., Moline, Ill., discussed the materials used in making cupola mixtures and analyzed their chemical and physical properties. H. F. Henninger, foundry foreman, International Harvester Co., Rock Island, Ill., covered cupola operations.

The president appointed the following nominating committee to recommend officers for the coming year: John Ploehn, French & Hecht, Inc., chairman; T. Stebbins, Red Jacket Mfg. Co.; and William Seiffert, Frank Foundries Corp.

Makes Inhibitors

E. F. Houghton & Co., Philadelphia, will manufacture and sell the products formerly made by Weaver Brothers Co., Cleveland, including pickling inhibitors, acid resisting lining for tanks, etc. J. C. Weaver, formerly vice president, Weaver Brothers Co., has been made manager of the cleaner and pickling products department of E. F. Houghton & Co.

Frank D. Chase Inc., engineers, has removed to the Bell building, 307 N. Michigan avenue, Chicago.

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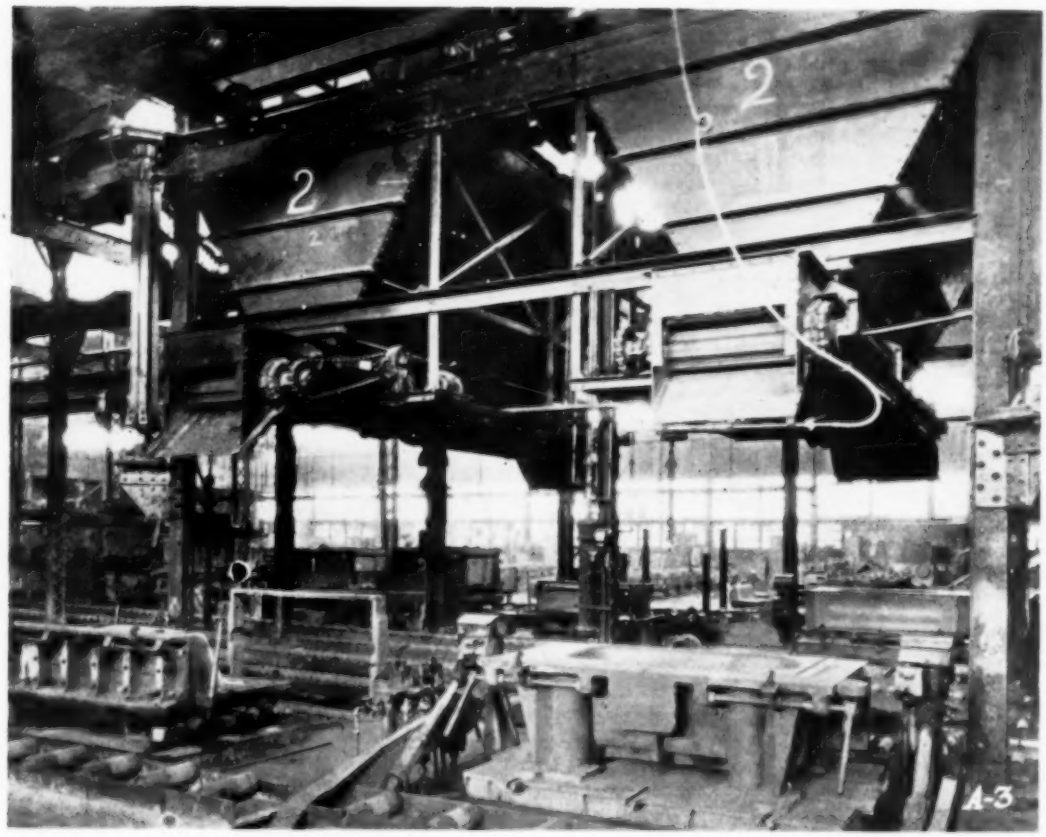
HERMAN MOLDING MACHINES



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Hartung Aktiengesellschaft, Berlin, Lichtenberg, Germany
Gibson Battle & Co., Limited, Sydney, N. S. W.

Cast Lamp Standards

Large order recently produced with special molding equipment

SPECIAL equipment installed by the Cleveland foundry of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to fill an order of lighting standards for the city of Chicago, included a set of heavy cast iron flasks—cast on the premises—and a sand slinging machine made by the Beardsley & Piper Co., Chicago. The order was for 8000 standards designed to light 250 miles of street and the time limit was 120 days, otherwise four months.

Meet Time Limit

Operating under normal condition, six days a week, four months means approximately 120 days. Under conditions obtaining for the past year, with foundrymen congratulating themselves on having sufficient business to run five days a week, four months elapsed time shrunk to about 80 working days. Where 66 castings per day would have met the specification under the first or normal set of operating conditions, an output of 100 per day was required to meet existing conditions. All the fluted standards, capitals, sockets, and aluminum canopies specified in the order were produced and shipped within the allotted time.

Molten iron was availale throughout the day, therefore a dozen flasks alternately rammed, poured, shaken out and rammed again sufficed to meet the daily schedule. The thin castings solidified almost immediately after the iron was poured into the molds and were in a condition to be shaken out a few minutes later. The row of assembled molds on the floor alternately grew and diminished from either end as pouring continued.

Fig. 1—Pattern for the cope was mounted on one stand while the drag pattern was mounted on a second stand

Two patterns, one for the drags and one for the copes, were mounted on suitable stands at right angles to each other and within the range of the swinging arm on the sand slinging machine, as shown in Fig. 1. The sand was wet down, cut over and then carried by a grab bucket suspended from a crane and dumped into a large steel hopper. A bucket elevator drew it from the bottom of the hopper and fed it to the mechanism which threw it with great force into the flasks.

To facilitate ramming the sand, the flasks were made without bars either in the cope or in the drag. The necessary rigidity was attained by extra heavy section, by one-piece construction, and by upper and lower flanges connected and braced by vertical ribs spaced 2 feet apart. Heavy trunnions were provided on the ends for handling the flasks by slings suspended from a beam attached to the crane.

The flasks were tapered longitudinally to conform in a general manner to the shape of the lamp standard. They were planed on the joint face and provided with a wide sand strip or flange which extended to within approximately 1½ inches of the pattern. This sand strip prevented the sand from falling out of the flask when the mold was lifted from the table or platform on which the sand was rammed.

A strong wood bottom board was clamped to the back of the drag to prevent the sand from falling out when the drag was rolled over. A iron plate was clamped over the cope to prevent the pressure of the iron in the mold from forcing the sand upward. The plate was provided with cast in devices for anchoring the chaplets on the lamp standard cores.

Fig. 2—Pouring end of each mold was elevated slightly and metal was poured through a single sprue and gate

Chaplets in the drag were cut slightly over length and then the points were driven into the bottom board until the head conformed to the height of a gage provided for the purpose.

Cores for the castings were made in two parts, a short length for the base end of the standard and a long approximately straight length for the remainder. Each of these sections was made in halves, then dried, assembled and pasted. A strand of wire wound tightly around the finished core served as a handle in addition to holding the halves of the core tightly together. In the mold the inner ends of the cores were butted together, but the vents from each section were taken off independently.

Molten iron was introduced to the mold through a gate leading into the lowest part of the base end of the standard. This gate received the iron from a vertical sprue in the center of that part of the core which filled the core print in the mold. A continuation of the sprue was formed in the green sand in the cope. This continuation was scooped out on top to form a pouring basin large enough to receive the stream from a 2-ton ladle. Adoption of this method involved the use of extremely hot iron, but it greatly simplified the amount of labor required to handle the iron.

Company Classifies Steel Castings

(*Concluded from Page* 15)

A low carbon steel, made in the electric or open-hearth furnaces and heat treated according to type and requirements, is designated as E-1. Castings falling in this class are said to possess unusual toughness and shock resisting qualities and are suitable for installation where alternating or vibratory stress conditions and moderately high strength are required. The company recommends this steel for automobile parts or heavy duty transporting machinery.

E-2 is a medium carbon alloy steel, made in either type furnace and heat treated according to type and requirements. The steel is similar to the other member of the E classification, but due to the higher carbon content is capable of exhibiting a higher tensile strength at moderate temperatures and therefore is useful for steam or similar fittings. A metal of that type may be given a special treatment by quenching and drawing, where the casting is of a suitable type, thereby developing even higher strengths than indicated in the accompanying table. The metal is adapted particularly to pneumatic machinery and all highly stressed parts.

For High Duty Work

Alloy steels of the nickel-chromium, chrome-vanadium or manganese-molybdenum types, suitable for large castings or to meet higher specification ranges after suitable heat treatment are included in the S classification. Special quenching and drawing treatment will provide considerably greater strength than is indicated in the accompanying table. The alloy content is higher than in the E classification. The metals falling in the S range are recommended for high duty work, high yield ratio, and resistance to shock and alternating stresses of all kinds. Because of high strength at high temperatures, the classification is suitable for superheated steam or oil refinery service.

The C classification includes alloy steels of the chrome-molybdenum type, with varied carbon content and treatments to meet particular conditions of abrasive resistance and high strength. C-1 is a medium carbon, chrome-molybdenum steel, made either in the electric furnace or the open hearth and supplied heat-treated according to requirements. The metal is close grained and tough with a good resistance to abrasive wear. It is suitable for sow blocks, rams and parts subjected to moderate abrasive wear.

As may be noted, the C-2 classification contains the highest specifications of the range of castings manufactured by the Detroit Steel Casting Co. It consists of a high carbon, chrome-molybdenum steel, made in the electric furnace or the open hearth and supplied heat treated to specific hardness or annealed for later treatment by the purchaser. Castings made of this material are suitable for die blocks, crusher parts, mulling machinery and allied work.

Alloy steels of chrome-silicon and chrome-silicon-copper type, with low carbon and high strength and ductility are provided under the O classification. The company states that the metal is able to withstand successfully moderate high temperature conditions up to a maximum of 1560 degrees Fahr. Class O-1 is an electric furnace product which is supplied in the heat treated condition. Tests show that the material resists scaling up to a temperature of 1450 degrees Fahr. without being brittle. It also possesses a composition which retards corrosion, although the steel is not in any sense stainless. Castings of the metal may be used for furnace parts for moderate temperatures, cyanide pots, etc.

The O-2 classification is similar to O-1, except that the chromium content is higher and the carbon lower in the O-2 variety. The material is produced in the electric furnace and is supplied in the heat treated condition. Great ductility with high strength and appreciable scale resisting properties provide ground for the claim that this is a useful cheap steel for moderate heat resistance. It is claimed that up to 1600 degrees Fahr. the material is 10 times as resistant to scaling as mild steel. It is not recommended for use where the temperature exceeds 1650 degrees Fahr. Castings may be used for many intermediate temperature applications, grate bars, carbonizing pots, cyanide pots, etc.

This is the third and concluding article describing the practices of the Detroit Steel Casting Co. The first appeared in January and the second in February.—The Editors.

Book Review

Iron and Steel, by Hugh P. Tiemann, imitation leather, 590 pages 4 x 7 inches, published by the McGraw-Hill Book Co. Inc., and supplied by The Foundry, Cleveland, for $4 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

This is the third edition of a volume which in general is a combination of a dictionary, an encyclopedia and a handbook covering iron and steel, allied industries and sciences. The wide variety of terms, designations and abbreviations employed in these industries are arranged alphabetically. As the author indicates, the definitions and descriptions of isolated terms and processes are found under the respective headings, while those employed in connection with some special subject or process are found under the latter, reference being made, as a rule, by page numbers instead of by titles.

For the benefit of those little versed in the metallurgy of iron and steel, and who may desire a guide of a more sequential study than that provided by the alphabetical arrangement, a brief outline of the metallurgy of iron and steel has been included in the first part of the book.

Two revisions from the original text, first presented in 1910 have permitted the author to broaden the field of the encyclopedia until it represents an exceptionally complete work. This edition includes information on the marked advances made in chemistry during the past decades, progress in metallography, new alloys, development and use of stainless steels and heat resisting steels, nitriding, new types of mills and other equipment, etc.

Practical Problems Feature Program

(*Concluded from Page* 13)

practical points of making tests; factors to be considered in the production of test bars; hardness, wear and machinability tests and the new A. S. T. M. specifications for gray iron. In addition, a symposium on gray cast iron will be presented on Monday, June 26 during the meeting of the American Society for Testing Materials. The American Society of Mechanical Engineers also will hold a foundry practice session during its annual meeting the week of June 26. H. H. Walther, Dayton Steel Foundry Co., Dayton, O., will present data on electric furnace gray iron and Oliver Smalley and W. W. Kerlin, Gray Iron Institute, will deal with gray iron for general engineering purposes.

O. B. J. Fraser, formerly in charge of the research laboratory of the International Nickel Co., Bayonne, N. J., now is located in the development and research department of that company's main office in New York, where he will be in charge of developments in the use of nickel and nickel alloys in the oil, and gas and coke industries, and in the industrial use of non-metallic compounds of nickel. Norman B. Piling, formerly in charge of metallurgical research, has been placed in charge of the research laboratory. E. M. Wise has been appointed assistant.

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COMMITTEE ON INDUSTRIAL REHABILITATION

A. W. ROBERTSON, *Chairman*

435 Seventh Avenue, Pittsburgh, Pa.

THE Committee on Industrial Rehabilitation was established last August as a national effort to promote the repair and re-equipment of factories, warehouses and large buildings, where such improvements will bring benefit through cost reduction, and by creating employment and stimulating business. Local committees are at work over the entire country and already commitments for more than $165,000,000 worth of rehabilitation work have been reported. 135-X

The Foundry Through the Years

(*Continued from Page* 23)

active, many having been at capacity operation through the first part of the year. Cast iron pipe shops report spring buying is increasing and prices have stiffened slightly. Orders for machine tools during February were at a high level and many foundries specializing on this class of work were busy. The steel industry is operating at 80 per cent of capacity. Pig iron and ferroalloy production in the United States for 1928 was 38,155,714 tons compared with 36,565,645 tons in 1927, an increase of 4.35 per cent. Ohio foundries in April were operating at 108 per cent of capacity."

Commencing Sept. 1 and continuing without interruption until July 1, 1929, J. E. Hurst presented a series of articles on the construction and operation of the cupola under the title *Melting Iron in the Cupola.* The articles later were compiled in a volume under the same title.

Era of Mergers Met

A new *Penton's Foundry List* showed changing trends of industry. A tendency toward larger shops, mergers and extensions of existing facilities to increase unit production. Commenting editorially THE FOUNDRY stated: "Those who have studied the industry closely during the past 2 years, the interval since the last roll call, cannot but have noticed the tendency toward increased production per unit of man power. Wherever the addition of new machinery, the rearrangement of existing facilities, or the substitution of new methods could bring increased production, changes have been made to reduce manufacturing costs. Such changes have been made in the face of increased capital expenditure in such cases as promised a reduction of cost over a reasonable period."

George Batty was appointed research director of the Steel Castings Development bureau and Paul A. Ivy was appointed vice president of the National Cast Iron Pipe Co., Birmingham, Ala. Unique among presidential campaign years, 1928 was marked by no depression. Operations in the foundry industry continued at a high rate. Foundrymen attending a meeting of the National Foundrymen's association in New York reported business good in practically all lines. Col. T. S. Hammond, Whiting Corp., Harvey, Ill., was elected president of the N. F. A.

In the Feb. 1, 1929, issue the publishers of THE FOUNDRY paid graceful tribute to Pat Dwyer, author of the *Bill* series, and his artist collaborator, H. L. Richey, upon the completion of 10 years service on the staff of the publication. Thomas H. Stickley described his experiences while operating a foundry on top of the Andes mountains in Peru. Among the prominent foundry men who died in the early part of the year were Otis P. Briggs, formerly commissioner and president of the National Foundrymen's association; Jesse L. Jones and Frederick L. Sivyer. Editorial comment throughout the year strongly stressed costs and merchandising features.

April 1 THE FOUNDRY announced the establishment of an advisory staff "made up of men whose day to day contact with a definite branch of the industry that each represents, affords an intimate knowledge of the latest developments. These men are recognized as outstanding experts, equipped by ability, education and training to speak with authority on their several specialties in the foundry field. The staff includes: John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland; J. W. Bolton, Lunkenheimer Co. Cincinnati, O., and Charles Vickers, Buffalo, N. Y." Mr. Vickers died recently and his place has been taken by N. K. B. Patch, Lumen Bearing Co., Buffalo. With this issue also the "Questions and Answer" department of THE FOUNDRY was expanded.

The April 15 issue contained the first section of a 4-part paper by A. L. Boegehold on how blast furnace operation affects the quality of pig iron and castings. E. A. Custer described a new development for cleaning castings with sand and water under hydraulic pressure. The United States Pipe & Foundry Co. commenced the production of centrifugally cast iron pipe in 18-foot lengths. At the A. F. A. convention in Chicago the J. S. Seaman medal was bestowed posthumously on Jesse L. Jones. A series of 12 articles "Producing Steel Castings in the Modern Foundry," by Charles W. Veach, was commenced in the June 1 issue. Considerable space in the June 15 and July issues is devoted to the activities of the American foundry party attending the International foundry congress in London, England.

Commenting editorially in the July 1 issue on the high rate of production in all foundry lines THE FOUNDRY said: "In any well regulated business, high production should result in increased prices and better profits. Periods such as the industry now is passing through should permit the manufacturer to make a profit sufficient to carry him through times of slack demand, which appear with more or less regularity."

Emilio Franchi in the Sept. 1 issue described how cast iron pipes were produced centrifugally in Brescia, Italy, from 10 to 25 feet in length and from 3 to 40 inches diameter. F. A. Lorenz Jr., reduced the grinding cost on steel castings 6 2/3 per cent. The General Electric Co. reduced the annealing time of malleable castings to 30 hours. The Oct. 15 issue carried a tribute to H. Cole Estep, vice president Penton Publishing Co., and for the preceding 20 years prominently identified with the foundry industry, who died Sept. 30.

In the Nov. 15 issue attention was directed to the recent installation of an X-ray machine for the inspection of castings in a large nonferrous foundry. In another nonferrous foundry a cupola was giving satisfactory service in melting the metal. The first of a series of 19 articles on the engineering properties of cast iron appeared in the Feb. 1. issue, 1930. The final article in the series was published in Aug. 1, 1931. V. A. Crosby and R. D. Wysong described the methods of analysis and the specifications which govern the purchase of core oils at the plant of the Studebaker Corp in South Bend, Ind.

Sand Study Stressed

Practically every phase in the production of cast iron pipe in the South was covered in a series of articles which commenced in March 1, 1930, and ended June 15, 1931. H. W. Dietert's formulas for calculating gate and runner areas were presented in the March 1 issue. Under the title "Sand Control Increases Economy in the Foundry," O. E. J. Abrahamson presented a series of seven articles between March 15 and Sept. 15. Harvey W. Hyde told how to make malleable iron castings in iron molds. According to the April 15 issue operations of steel foundries were increasing steadily. Several plants were working at better than 100 per cent of capacity. The average of the shops of all reporting members of the Steel Founders Society of America was 78 per cent.

A letter from Professor Beese, Pennsylvania State college, provoked a flood of comment in the June 15 issue, and later issues, on the subject of teaching foundry practice as part of the engineering course in colleges. From an editorial in the Sept. 1 issue: . . . Casting salesmen should stiffen their backbone against the drive for cut prices. The merits of their product sound castings of definite physical properties, adapted to the needs of the user, should be drilled into the mind of the prospective buyer. When the subject of price returns again and again—as it will—hold the line and don't cut because a buyer quotes a competing foundry as quoting a lower rate. Probably the competitor did not make such an offer. If he did, and the price is such as will yield no profit, let him have it.

Apparently the industry was hovering in the vicinity of the greased skidway of falling prices.

Between Oct. 1 and the close of 1930 THE FOUNDRY presented articles on "Long Heating Periods at High Temperatures Affect Gray Iron;" "Mechanical Tests Involve Many Difficulties"; "Tablets Honor Kentucky Pioneers"; "Otis Steel Co., Casts 230,000-pound Steel Anvil Block"; "Strong Aluminum Castings Obtained by Improved Foundry Practice"; "Cupola Pitfalls and How to Avoid Them." Eulogistic reference was made to Dr. Richard Moldenke who died Nov. 17 and to Isaac Frank who died Dec. 1.

The first of a long series of articles entitled "Prevent Losses with Proper Gates and Risers," appeared in the Jan. 1, 1931, issue of THE FOUNDRY. Succeeding articles in the series have appeared up to the present and will continue to appear for some time in the future. A symposium of answers appeared in the April 1 issue in reply to the query "How do declining markets affect casting costs?"

Under the heading "Mirroring an Industry" the April 15 issue presented a cross section of opinions of men prominent in all industrial lines on the interdependence of other industries on the foundry. Following a resume of the influence of castings and the interdependence of the four fundamental divisions of modern industry, agriculture, manufacture, transportation and service, the presentation served to demonstrate the truth of the various claims and statements. Without doubt this was one of the most spectacular and attention compelling numbers ever issued by the publishers of THE FOUNDRY.

First reference to a rotary type furnace operating on powdered coal for the production of plain and alloyed gray iron appeared in the July 1 issue. The same issue presented an account of how crankshafts and connecting rods are cast in alloy steel at a prominent Midwest steel foundry. In the July 15 issue John Howe Hall exposed the "Lure of the Alloys" and the many fallacious ideas held on the subject both by insiders and outsiders. Illustrated description of the molding and casting of a 230-ton steel casting at the plant of the Bethlehem Steel Corp., appeared in the issue Sept. 1.

The Jan. 1, 1932, issue contained the first of two articles by the late Charles Vickers on early steel foundry history in Milwaukee. The March 1 issue contained the first of three articles by the same author on the manufacture of titanium aluminum bronze. April 15 THE FOUNDRY was converted to a monthly publication, enlarged and improved in contents and appearance. The fortieth anniversary of the founding of the publication was marked in September issue by a special insert from which we take the following in the opening statement: "This month THE FOUNDRY enters its fortieth year. Founded on the vision of a man who saw an industry to be built from a number of far flung, unrelated and disorganized casting shops, the first issue of THE FOUNDRY was launched in Detroit, September, 1892. The elaboration of principles pronounced in the *Salutatory* lead editorial and the advertisement appearing on page 25 of the first number are forecasts, uncanny in their forward looking prophecy. They stated the aims and purposes and have bounded the accomplishments of the paper's first four decades." P. D.

British Institute Holds Annual Meeting

The twenty-fifth annual general meeting of the British Institute of Metals was held in London, March 8 and 9. Presenting the report of activities, it was stated that several American members had expressed disappointment in the postponement of the annual meeting which was to have been held in North America in 1932. The hope was expressed that the visit might be arranged at a later time.

The election of officers for the year 1933-34 resulted as follows: president, Sir Henry Fowler, chief mechanical engineer, London Midland and Scottish Railway Co., Derby; vice-president, Prof. C. H. Desch, Department of Applied Science, The University, Sheffield, and Prof. R. S. Hutton, Cambridge University.

Numerous problems relating to fabrication and use of metals were discussed at the technical sessions.

Book Review

Patternmaking, by James Ritchey, and revised by Walter W. Monroe, Charles Wm. Beese and Philip Ray Hall, cloth, 223 pages, 5½ x 8½ inches, published by the American Technical Society and supplied by THE FOUNDRY, Cleveland for $1.75 and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

Both the original author and the men who have had a part in revising this treatise on patternmaking have been identified with the woodworking or patternmaking departments of various engineering and technical schools. P. R. Hall, the final revisor, is instructor of foundry practice, Pennsylvania State college, State College, Pa.

The book is divided into three main parts, the first being devoted to the practical requirements necessary in pattern construction. This section discusses the various types of woods and metals used, hand tools, measuring tools, a variety of machine tools and machines employed. Principles of molding practice which influence the construction of patterns also are presented.

The second section of the book discusses the construction of simple types of patterns, both one piece and split. Information also is presented on finishing, standard colors for patterns, gluing, clamping, etc. Construction details are given for a countershaft pulley, a solid engine crank, T-pipe connections and elbows, globe valves, etc. The third section discusses complicated pattern construction, such as a hand molded hydraulic turbine, hollow roll cast on steel shaft, etc. Information also is given on green sand coring, mounting, match plates, equipment for machine use, pattern numbers, and special equipment for stripping plate machines. The work is well illustrated with reproductions of 359 drawings and photographs.

Suggests a Change

Our old friend Lippy Hornblower, writing in the Metals section *News Letter* of the National Safety council, discusses the important subject of accident frequency as follows:

The National Safety counsel is gotta give us a new deal. We've got to have some different rules to figure by. We can't no longer work a million hours to get our frequency. We'd be three or four years findin' out what it is. I'm in favor of inflating the frequency. There ain't enough of it.

Say a man gets hurt today. Unless he's a watchman his next regular shift won't be until March 29 and then he'd better call up to make sure they've got an order before them or it won't be till April 12. A man can get a leg broke and only miss about three shifts before he is able to work again.

Now take severity. The counsel sez to figure 6000 days for a permanent death. That's away too high. If a man lived to be 80 years old he wouldn't work that many days. They figure a hand at 3000 and a thumb at 600. That outa be vise verse. A good thumb is worth a lot more today than a hand. Ask any hitch hiker.

Plan Exposition

The 6th Midwest Engineering & Power exposition will be held at the Coliseum, Chicago, June 25-30. Special attention will be given to renovizing power plants, utilizing modern equipment and supplies.

Granville P. Rogers, formerly manager, Steel Founders' Society of America, now is affiliated with the Paper Cup Manufacturers institute, with offices at room 1654 Graybar building, 420 Lexington avenue, New York.

The **GRIFFIN**

Hot-Blast Process

for **CUPOLAS**

TO the thermal and net money benefits of cupola hot-blast and high heat recovery from cupola gases, the Griffin Process further adds the distinct advantage of continuous cupola flow into teapot-spout reservoir and mixing ladle, and transfer to the moulds in bottom-pouring ladles, for triple elimination of slag and maximum efficiency of sulphur control.

The Griffin Hot-Blast Process reduces coke consumption more than 25 per cent, permits the safe use of more scrap in the charges, improves the melting and pouring practice at every stage from start to finish, promotes safety, assures greater uniformity and better quality of the finished castings and greatly reduces rejection losses.

All installations to date have shown a net return of at least 50 per cent on the investment.

Write for revised Bulletin No. 532

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WHEN you make alloy-iron castings by using Mayari, a natural nickel-chromium pig iron, the results far exceed those obtainable by merely adding the alloying elements to the molten iron.

Mayari Pig Iron contains about 1 per cent nickel and 2 per cent chromium; therefore, if the cupola mixture contains a small addition of Mayari, the castings will contain very minute amounts of these alloying elements.

Yet this small Mayari addition decidedly increases the tensile strength of the castings, and they also gain higher resistance to heat and wear, improved machining qualities, freedom from spongy spots and segregation, and other desirable properties.

In view of the small content of nickel and chromium that the castings derive from Mayari, it is evident that the improvements are not directly due to the addition of these elements, but result from the presence of Mayari in the mixture. They can be obtained in no other way.

The small proportion of Mayari that is sufficient to bring about these improvements makes the use of Mayari the economical way to produce fine alloy-iron castings.

MAYARI PIG IRON

BETHLEHEM STEEL

Bethlehem Steel Company, *General Offices:* Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, York, Wilkes-Barre, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Indianapolis, Detroit Chicago, St. Paul, Milwaukee, St. Louis, Houston, Dallas. | *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

Cylinder Molds Are Skin Dried

(*Concluded from Page* 17)

which is semimechanical, every feature connected with the movement of the molds and the temperature to which they are subjected, is mechanical and automatic.

To suit local conditions the conveyor has a capacity of 60 molds per hour which means that each mold is subjected to the heat of the oven for approximately 7 minutes. Some of the molds are for 8-cylinder castings while others are designed for 6-cylinder blocks. Flasks for the large cylinders measure 14 x 26 x 49 inches. The smaller molds conform to the following dimensions: 11 x 19 x 28 inches.

The oven chamber is 18 inches high, 30 inches wide and 40 feet in length. The comparatively heavy cast iron conveyor plates which carry the molds are spaced 6 inches apart to provide clearance in rounding the curves. The plates travel on rollers and are actuated by a continuous chain driven by the small motor and reduction gear train shown to the extreme left in Fig. 2. Suitable coverings protect the mechanism from sand and dust.

The drag mold is lifted directly from the molding machine and placed on one of the conveyor plates where it is sprayed with a thin mixture of plumbago and molasses water as shown in Fig. 1. Conceivably at this point a careless or inefficient workman might ruin the mold by soaking the sand to such an extent that all the water would not evaporate during the brief period in the oven.

May Control Blacking

However, this danger is rather remote. The operator readily learns the correct amount of blacking to apply. Constant supervision at the discharge end of the oven readily would detect a mold in which the face was not properly dried. Up to the present the precaution has not been found necessary, but should conditions warrant the change, a spray can, containing just the correct amount of blacking for a single mold might be employed.

Heat for the oven is supplied by a gas flame. The heated air is discharged into the oven by a fan running at 800 revolutions per minute and delivering 2500 cubic feet of air per minute. Suitable baffles inside the upper part of the oven deflect the heat and thus insure drying the deepest parts of the molds. At the entrance of the oven the temperature of the heated air is approximately 600 degrees Fahr. This temperature rapidly increases to approximately 1150 degrees Fahr. immediately under the hot air hood. At the discharge end where the molds emerge from the oven, the temperature shows about 750 degrees Fahr.

Makes Small Cupola Of Gray Iron Castings

The cupola shown in the accompanying illustrations was built by the Bullard Co., Bridgeport, Conn. to replace a much smaller one which had been used for experimental purposes. It has been used for over 2 years making iron castings up to 1000 pounds in weight. Charges are 400 pounds made up of pig iron, scrap, and steel scrap, and varying in composition from no steel scrap to all steel scrap with alloys. The coke split generally used is 45 pounds.

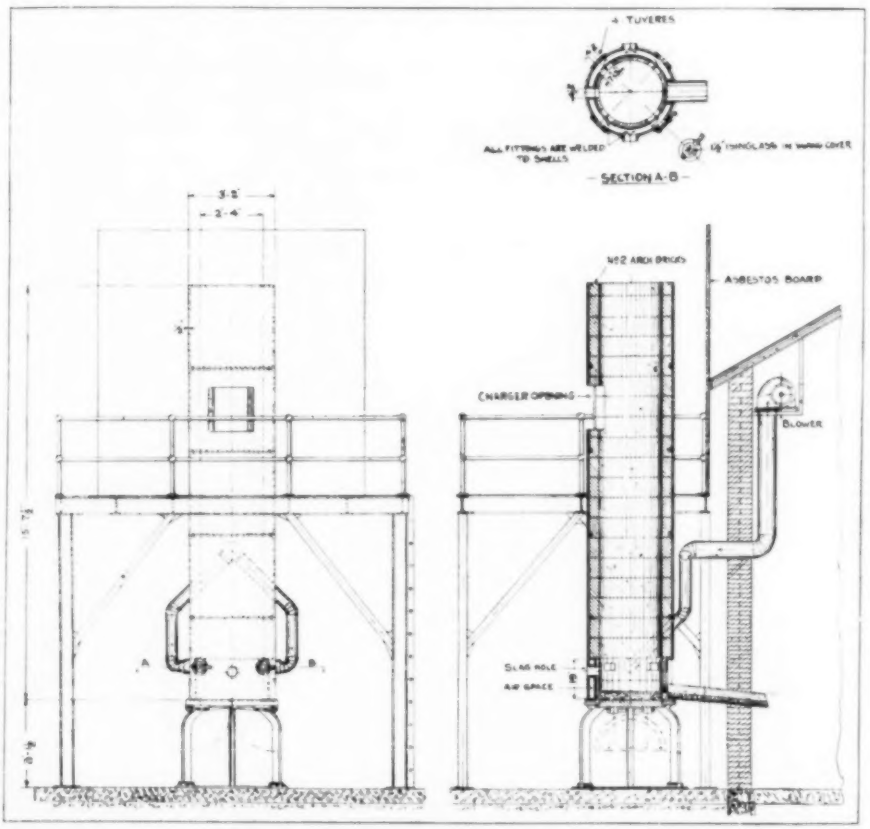
Charges are made up in the yard in strong wooden boxes, each holding two charges, and are hoisted to the charging platform by the yard cranes.

As shown, the stack was made up in five sections. These sections were made by using a pulley ring to make sufficient cores for the height desired and ramming up ½-inch strips of wood to furnish the thickness of metal. An internal flange with two cored holes was swept in the top and bottom cores of three sections, and in the top only of two sections. The cored holes were used to facilitate erection and also to bolt sections together.

Bottom doors, frame, legs, etc. were cast from rough patterns made up some years ago when making a forehearth for a 42-inch cupola. It will be noted that the windbox is inside the cupola. The casting forming the inner wall of the windbox also was made from a pulley ring pattern, and had external flanges top and bottom, which were welded to the outer shell. As there is only a 2-inch firebrick lining between the windbox and the wall of the cupola, a slight preheating of the blast is effected. It has been possible with the cupola to melt very hot iron at the rate of about 2700 pounds per hour. The sand bottom is rammed in place by reaching through the breast opening.

This method of construction may have cost more than the usual fabricated steel construction, but it provided work for our own men, and will outlast a fabricated steel shell without any need for painting.

National Industrial Conference Board has published a report providing a program of unemployment reserve for American industry and stressing the importance of prompt concerted action by industrial leaders to guide and shape legislation on that subject.



The stack is made in five sections and the windbox is on the inside of the cupola

Gray Iron Institute Meets

(*Concluded from Page* 21)

Carter, Newark, N. J., vice president of the institute. Mr. Carter emphasized the value of local cost groups in stabilizing the cost work of the gray iron industry and building a spirit of co-operation among producers in the districts where groups were operating. He strongly advised further development of that phase of the institute work.

Following the luncheon, A. E. Grover presented an interesting talk on certain phases of the cost system of the institute, using charts to illustrate important features. J. D. Coltman, in a paper on "The Forward March of Gray Iron," reported on the work of the technical committee, of which he is chairman. Mr. Coltman stressed the great importance of the standards for gray iron, and pointed to the service of the committee in answering questions on technical matters, securing publicity for gray iron through papers before engineering groups, and in supplying information for handbooks and other publications.

Gray Iron Specifications

A. C. Ziebell supplied the founder's viewpoint on the specifications for gray iron castings designed as A48-32T. Mr. Ziebell stated that not only was it necessary to raise the standards, as had been done in the new specifications, but it was necessary to prove that the standards are met. By raising the standards a better demand has been created, and consistent performance of the metal demands a higher price. W. W. MacMillen, chairman, iron and steel committee, National Association of Purchasing Agents, reported that on the whole, the specifications have been approved by his committee and will be voted upon at the annual meeting of the association. He presented several minor changes which members of the committee suggested.

Charles Seelbach, Forest City Foundries Co., Cleveland, presented a report of the Light Gray iron subcommittee under the title of "Properties of Gray Iron for Light Structures Analyzed." This committee has undertaken a series of tests using two tensile bars cast $\frac{7}{8}$ and $\frac{3}{8}$ inches in diameter, three transverse and rigidity bars varying from $\frac{7}{8}$ down to 5/16 inches, one machinability test piece (a step bar) representing sections cast from $\frac{3}{8}$ to $\frac{1}{8}$ inches thick, and one damping test piece to study the ability of light gray iron to absorb vibration. Experiments on the efficiency of gray iron in damping vibration, regardless of weight, indicate that it is 12 times as great as steel and 20 times as great as aluminum. The committee has developed a drill test which has possibilities as a control test.

Discussion following this paper considered the damping characteristics of gray iron. It was stated that the size of the graphite particles influences the damping properties greatly, and that large graphite flakes absorb vibration, while a lower carbon iron with smaller flakes has more of a tendency to carry vibration along. Mr. Tuscany expressed the opinion that the damping tests are developing information of real value, not only from the engineering standpoint, but from the sales viewpoint as well.

W. W. Kerlin, metallurgist of the institute, discussed the relation of the new specifications for gray iron to control and sales problems.

W. N. Bayless, Bayless-Kerr Co., Cleveland, stressed the necessity for co-operation in any merchandising project. He stated the organization should have specifications, which already have been adopted, standards which would come through a certification plan, and publicity. Arthur J. Tuscany closed the merchandising session with a paper on "New Uses for Gray Iron," in which he discussed questions which must be taken into consideration when developing new products.

In the final session, William J. Grede discussed "The Gray Iron Institute Fire Insurance Plan," and J. H. Bruce, Bowler Foundry Co., Cleveland, talked on the plan from the viewpoint of the subscriber.

Committees Meet During A.S.T.M. Regional

Committees of the American Society for Testing Materials held group meetings in New York, March 6 to 10, during the regional meeting devoted to a symposium on "Motor Lubricants." A subcommittee on steel castings under the chairmanship of W. C. Hamilton, research director, American Steel Foundries, Chicago, approved tentative specifications for alloy steel castings for structural purpose. The new specifications will be submitted to the entire membership of committee A-1 for recommendation to the society as a tentative standard.

The specifications provide for three classes of castings for use in applications at mechanical stress, but where high temperatures do not prevail, namely class A, full annealed; class B, normalized; and class C, liquid quenched. Two grades, one having 75,000 and the second 85,000 pounds per square inch tensile strength, are specified under class A. Class B has three grades providing 85,000, 90,000 and 100,000 pounds per square inch tensile strengths. Three grades under class C require tensile strengths of 90,000, 120,000 and 150,000 pounds per square inch. These specifications were prepared by a subcommittee under the chairmanship of John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Committee A-3 on cast iron voted to recommend the adoption of the tentative specifications for gray iron castings (A 48-32T) as standard. These specifications, which were approved for publication as tentative standards at the June, 1932 meeting of the society, were formulated by Committee A-3 with the co-operation of the Gray Iron institute. The specifications, which include classifications ranging from 20,000 to 60,000 pounds per square inch tensile strengths, were presented in the September issue of THE FOUNDRY on page 32. It was pointed out that the introduction of specifications as tentative already has removed an element of uncertainty in buying and selling gray iron castings and the specifications have been well received by industry during the past year. When adopted as standard, it is expected that their value will be increased further.

It was announced at the meeting that a report on impact testing of cast iron, based on an investigation by the subcommittee on impact tesing under the chairmanship of J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., will be presented at the annual meeting in June.

Committee on cast iron is co-operating in a joint symposium on cast iron, sponsored by the A. F. A. and the A. S. T. M. A symposium on specifications will be held on the last day of the A. F. A. meeting, Friday, June 23, and the symposium on cast iron on Monday, June 26, the first day of the A. S. T. M. meeting. Hyman Bornstein, Deere & Co., Moline, Ill., is chairman of the committee on cast iron.

Presents Data On Sands and Minerals

The third number of the magazine *Sands, Clays and Minerals*, published by Algernon Lewis Curtis, Chatteris, England, contains several articles of interest to the metalworking field, including the following: "Examination of Minerals in Ultra-Violet Light" by Dr. Julius Grant; "British Minerals," by A. G. F. Gregory and E. P. Bottley; "Tripoli Powder," by R. Pearmain; "English Industrial Sands" by A. L. Curtis, and "Refractory Cements and Lutes" by W. O. Lake.

Controlling Properties of Cores

(*Concluded from Page* 19)

compound. With a ratio of sand to oil of 40 to 1, the gas content is 16.7, and at a ratio of 80 to 1 the gas content is reduced to 8.4.

Rate or speed at which a core will give off its gas in a mold does not seem to be of prime importance. A number of core binders have been tested for this property and the difference in rate of gas evolution is slight at the beginning of heat application. The rate of gas evolution curves for a pitch-oil core compound and linseed oil core compound is shown in Fig. 7. It may be noted that the rate of gas evolution at beginning of heat application does not vary greatly until a period of three minutes has elapsed, after which period the metal in the mold would stand much punishment, and possibility of causing a defect is remote. The rate of gas evolution on the casting cooling period differs markedly for the various core binders, as may be noted by comparing the gas volume curves after the three minute heating period.

The moisture content of the green core sand mix has a great influence on green sand strength and also on the ultimate baked strength of the core.

Either a lower or higher moisture content than ideal will result in a low green sand strength. When the moisture content is too low, the resultant low green strength will cause the core to sag in transporting the core to oven. A high moisture content will cause sagging to take place in the oven.

Check Moisture Content

Baked strength of a core is low when the moisture content of the mix either is lower or higher than ideal. The baked tensile strength curve, Fig. 8, shows that strength is a maximum at 3 per cent moisture, and decreases either with an increase or decrease of moisture content.

At zero moisture content, oil bonded cores have a second high strength point which may be equal or greater than ideal moisture content. The strength curve as shown in Fig. 8 shows 215 pounds at zero moisture and 250 pounds at 3 per cent moisture.

The strength curve, Fig. 8, represents the behavior of a vegetable oil bonded core. A linseed oil bonded core will show substantially the same variation of strength due to moisture variation.

Summarizing the fineness of every shipment of core sand should be tested either by a fineness test or by base permeability method to insure that shipments come within five points of a designated A.F.A. average fineness mesh.

Moisture content of every batch of core sand mix should be tested and controlled within limits of 1 per cent, for example, 5 to 6 per cent moisture.

Gas content of cores baked in a production oven should be determined frequently by the furnace—CO_2—1800 degrees Fahr. method. When gas content for oil bonded cores exceeds 16 cubic centimeters per gram, then it may be assumed that baking time should be increased even at the expense of a maximum strength point.

Surface hardness of cores should be ample to prevent excessive amount of core sand to rub off when handled by hand. This hardness may be increased by lowering baking temperature, or by increasing moisture content.

Baking temperature to be as high as possible to secure the shortest baking time, even at a slight sacrifice of such properties as hardness or gas content. This produces the most economical core. The amount of deviation from an ideal core depends on the requirement.

Many Variables

TO AVOID production of defective castings, foundrymen find it necessary to control many variables, including the quality of the core. Such factors as grain fineness, moisture content, gas content, surface hardness and baking temperature are of extreme importance as related to defects in castings. This interesting article discussing these points and the relation to satisfactory cores is from a paper presented at the Panrussian conference on "Testing, Grading and Practical Application of Foundry Molding and Core Sand," which was held in Moscow, Feb. 5 to 10, under the auspices of the Panrussian Scientific Technical Foundrymen's association. Mr. Dietert is research engineer, and Mr. von Valtier is chemist, United States Radiator Corp., Detroit.

Patent Research

Patent and Technical Information Service, 1336 New York avenue, Washington, D. C., has been established to do special research work on patent office records and to make available information as to technical data compiled by government sources. E. Drew is director.

Melting Gray Iron In the Crucible

(*Concluded from Page* 16)

in strength on the transverse bars was approximately 62 per cent and the increase on tension bars 64 per cent. The silicon content of this remelted metal was 1.55 per cent and the total carbon content 3.30 per cent.

Taking into consideration the fact that the carbon was reduced only 20 points by remelting, it is questionable whether these strengths could be obtained by remelting in the cupola, even if the resultant metal had the same analysis.

Book Review

What Is Technocracy?, by Allen Raymond, cloth, 184 pages, 5 x 8 inches, published by Whittlesey House, McGraw-Hill Book Co., Inc., and supplied by THE FOUNDRY for $1.50 and in Europe by the Penton Publishing Co., Ltd., Caxton House, Westminster, London.

When interest in Technocracy began its phenomenal spread throughout the country several months ago, the *New York Herald Tribune* assigned to the author the task of digging out facts regarding the story of that movement. The articles were published in that newspaper in December, and have been expanded to a certain extent for this volume. The book offers a detailed and exceedingly interesting account of Technocracy in its three fold aspect of a movement, a body of ideas and a plan.

The author deals first with the movement, its history, introduction and spread. He explains the strange furore which the movement has caused and attempts an appraisal of the significance and social value of the movement. The personalities and careers of the men heading the organization are presented, and a chapter is devoted to the background and work of Howard Scott who was recognized as the chief spokesman of Technocracy.

Criticisms, favorable and otherwise, which have come from leaders of contemporary economic thought, are recorded, and one chapter presents a frank appraisal of what may prove a factor in our social structure. A postscript records the split on Jan. 23, which divided the movement into two sections, one directed by Scott and the other resting under the wing of Columbia university.

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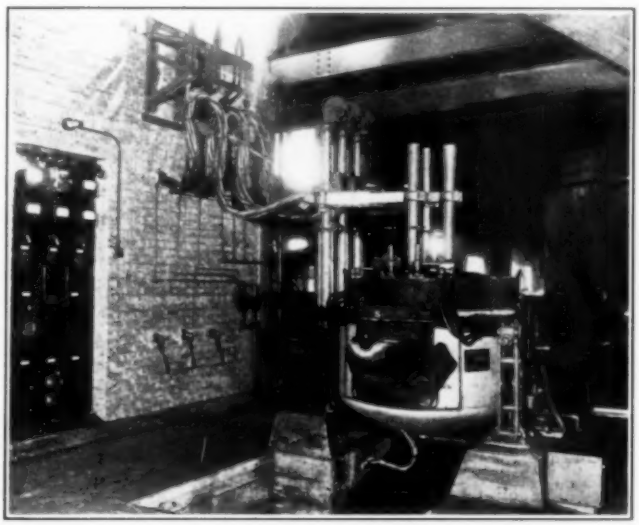

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European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Elements in Iron

Influence of Several Less Common Elements When Added to Cast Iron, by J. E. Hurst, the *Foundry Trade Journal*, London, Feb. 23, 1933.

Influence of a number of elements on cast iron is discussed in this article. The elements which come under this category are bryllium, boron, sodium, magnesium, calcium, zinc, selenium, arsenic, zerconium, tin, antimony, cerium, lead, bismuth and uranium. Some of these elements, while uncommon as additions to cast iron, are not uncommon from the point of view of rarity a fact which is of additional importance in the knowledge of their influence.

Pyrometers

Use of Optical Pyrometers in the Foundry, (*Utilisation des Pyrometres Optiques Dans les Fonderies*) by H. Held. *La Revue de Fonderie Moderne*, Paris, Oct. 10, 1932.

For temperatures above 1600 degrees Cent., or in cases where it is inconvenient to approach the source of heat to be measured, optical pyrometers are convenient. They can be divided into two groups: Total radiation pyrometers and partial radiation pyrometers. The principles of each of these two types are summarized, and a description of two particular instruments is given.

Single Piston Rings

The Single-Cast Piston Ring in Green-Sand Molds, by Colin Duncombe Abell, *Foundry Trade Journal*, Dec. 29, 1932.

Pattern arrangement, methods of gating, thermal considerations of the mold, metallography and the advisability of using alloys in piston rings are discussed in this article. The author points out that while single-cast piston rings usually are cast with crucible melted metal in England, he doubts strongly the necessity for that action, especially in view of the cost.

It is pointed out single-cast pistons do not usually exceed 5 inches in diameter, though larger ones have been made quite satisfactorily. In the latter case, it is not economical to produce much larger rings, as the work entailed in the molding processes rises out of proportion to the ring castings.

Etch Shows Phosphide

The Phosphide Eutectic in Cast Iron (Ueber das Phosphideutektikum im Gusseisen), by R. Mitsche, *Die Giesserei*, Dusseldorf, Germany, Dec. 9, 1932.

Various methods that have been developed for etching cast iron, so that the phosphide eutectic may be distinguished, are mentioned, but the author finds that the simplest is through the use of the reagent suggested by Daeves. The reagent is composed of 20 grams of potassium ferricyanide, 10 grams of sodium hydroxide, and 100 grams of water, and is used cold. A short etch gives a brown to violet color to the phosphide eutectic without attacking the cementite. The following procedure is recommended: The polished specimen is etched for a second in alcoholic nitric acid to color the solid solution, washed in water, and then placed in the cold Daeves reagent without drying. It is allowed to remain in the solution for a few minutes, then washed and dried. Microscopic examination of specimens etched in that manner shows the cementite as pure white, the phosphide eutectic as brown, and the solid solution dark.

Cores in Loam

Cylindrical cores in Loam (Noyaux Cylindriques en Terre) by the Technical Committee of the Belgian foundry association. Fourth instalment. Rapporteur: M. Vandendries. *La Fonderie Belge*, *Liege*, October, 1932

This instalment describes methods of preparing cylindrical cores in loam, supported on barrels, in certain special cases. It covers the description of a core for the piston of an hydraulic accumulator and a core for the base of a steam engine.

Gray Cast Iron

New Researches on Gray Cast Iron, (Nouvelles Recherches sur la Fonte Grise), by Eugen Piowowarsky, *La Fonte*, bulletin of the French center of foundry research, Paris, October, 1932.

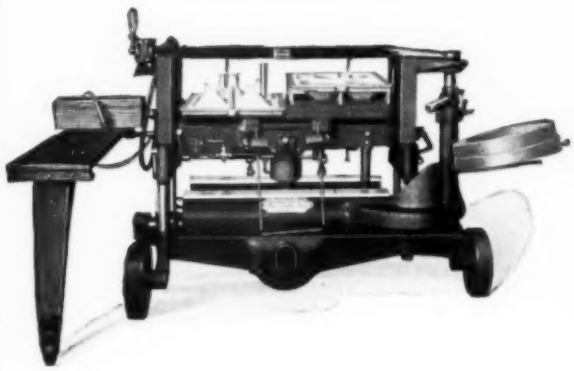
This article is extracted from a lecture by the author at the opening of the new foundry laboratory at the technical institute of Aix-la-Chapelle. It reviews investigations effected up to the date of the opening. Dealing with the superheating of cast irons, experiments confirm work of Bardenheuer and Zeyen, which show that irons with a low carbon content give bad results if submitted to too much superheating; but irons with a carbon content over 3 per cent are satisfactorily influenced by superheating. To achieve best results from superheating, temperature and duration of the treatment must be regulated in accordance with composition.

Progress has been made in finding relations between volume of air-blast and temperature of iron. Investigations are being made on a new type of cupola which is fired by fuel oil. Investigations on foundry coke have shown that there is a microscopic porosity in coke, the effects of which are more important than the microscopic porosity.

The author reviews researches on influence of special elements on cast iron. Experiments on growth made on grate bars have revealed that the best irons are those rich in carbon. It also has been found that it is of interest to limit the phosphorus content to 0.4 per cent. Iron containing a minimum of 12 per cent of aluminum has been found to resist at a temperature of 1150 degrees Cent. in a highly-oxidizing atmosphere. The detrimental effects of additions of antimony have been proved.

Experiments also have been conducted with a view of determining the resistance to abrasion and wear of cast iron, and the favorable influence of silicon, as well as the favorable influence of a form of graphite similar to that obtained after reheating, has been ascertained. Pearlitic cast irons generally have low figures of wear.

"MODERNS"



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A core sand binder in powdered form, which mixes with sand readily and has great binding strength. Goulac is smokeless both at the oven and mold and cleans easily from the casting. It may also be used for spraying cores, making paste and for a tempering element for dry or green sand facings.

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*1

The troops have been called out for less

The Adventures of Bill

BY PAT DWYER

LYING low until the storm blew over was the explanation offered by Bill the other night when he blew in about an hour ahead of his usual time. I did not press him for particulars. Knowing him as well as I do, I was reasonably certain he would lead up to the subject in his usual oblique manner. Finally I was rewarded.

"Furnaces are funny things," he said. "After behaving gallantly all winter, eating up vast quantities of coal after the manner of a battleship foaming along under forced draft, the furnace in my humble cot began to exhibit symptoms of indigestion, asthma, or the heaves or something about a month ago.

"Ordinarily a gentle shake of the grate was sufficient to send a flame shooting into the chimney. Even with the lower drafts closed and the damper in the smoke pipe set at half or quarter speed, the fire burned briskly.

"Gradually the ferocious appetite appeared to die down. Fresh additions of fuel were received with apathetic indifference. The old vim and vigor were conspicuous by their absence. The fire responded feebly to repeated poking, and to shaking of the grate. Heroic remedy in the form of wide open drafts and the damper in the pipe set to full speed ahead only resulted in a spasmodic and feeble flicker.

"A diagnosis of the symptoms seemed to indicate that the lungs or bronchial tubes were congested. Nothing short of a major operation would relieve this condition and clear the passages. Lacking an *X*-ray eye, I was handicapped in making a physical examination to determine whether the obstruction was in the chimney, the smoke pipe, or in the chamber surrounding the dome. When and if I ever am consulted in designing a hot air furnace I shall insist upon the introduction of peep holes—easily accessible peep holes—for the benefit and guidance of amateur chimney sweeps and furnace tenders.

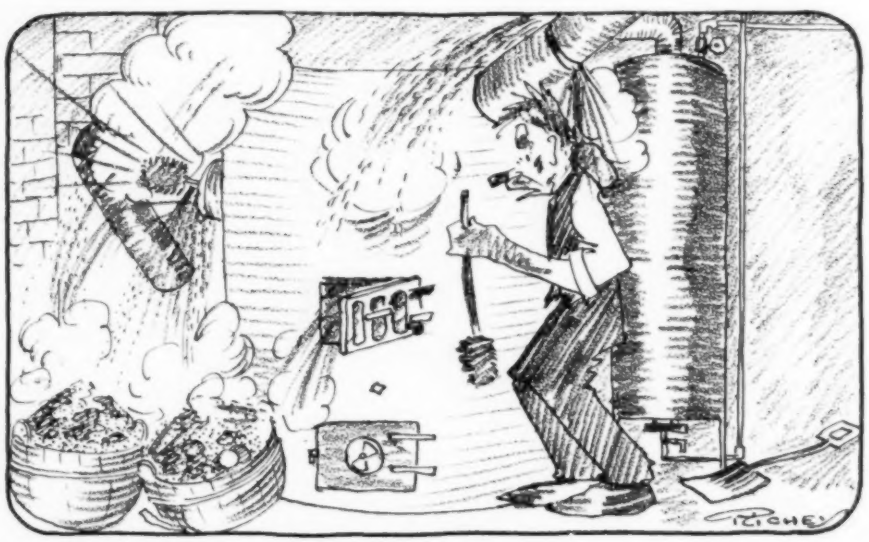
"In justice to the builders of this particular furnace I must admit that it is equipped with a clean out door at a point diametrically opposite the opening for the smoke pipe. Unfortunately the fiendish and handy-andy ingenuity of the lad who installed the hot water tank and gas heater induced him to place them so near the furnace that the clean out door can only be opened part way.

"The words CLEAN OUT in raised letters on the door seemed to indicate that this was the proper spot in which to plunge the lance and commence operation. I opened the door to the widest extent possible, only to discover that I was merely in the hall way or anteroom between the galvanized shell and the cast iron dome of the furnace proper. A nozzle on the outside of the dome, presumably leading to the interior, was closed by a sheet iron cap that resisted every effort to remove.

"Probably it fitted snugly when the furnace was set up, cold. Now, owing to expansion of the heated nozzle and the fiendish attraction two pieces of metal long in juxtaposition have for each other—note nuts and bolts—the cap was as tight as a miser's conscience or the skin on an Egyptian mummy. I tried to pry it loose with a bar and a pair of pliers, but with the exception of burning the ends of my fingers, I had no more success than if I had tried to lift the Rock of Cashel with a bit of black thorn stick.

"I was tempted grievously to hit the cap a good healthy belt of a hammer and was restrained only by the fact that the door, referred to previously, stood in the way of a proper whole arm swing. Also by the further fact that if I smashed the cap I had no way of fashioning another to take its place. I took comfort in the reflection that perhaps I could operate from the smoke pipe side and thus leave the cap undisturbed. However, I made a mental reservation that when the good old summer time rolled around and the furnace no longer was in use, I either would remove the cap or smash it beyond hope of recognition. Probably at one time or another in your own experience you have noticed the extent to which burned fingers raise the steam pressure.

"For want of statistics on the sub-



Apparently he is waiting for a water pipe to burst or the boiler to explode

ject I cannot say positively that crimes of violence are more prevalent in cities than in country districts, but if that condition prevails, as I am inclined to believe, it is due in large measure to the habit of the city dweller in moving frequently from one house to another. Intense aggravation incident to taking down and setting up stove pipes would break down the morale of that old veteran Job and cause the gentle St. Francis of Assisi to throw stones at the birds instead of coaxing them to come at his whistle and perch on his shoulder.

"With the exception that it is larger in diameter and therefore more cantankerous than the ordinary stove pipe, this furnace smoke pipe presented insiduously all the crime provoking characteristics of this piece of household equipment.

"The pipe is made up of four lengths and two elbows. The inner end of the first section fits over a collar surounding an opening in the chamber dome of the furnace. The outer end fits snugly into one end of the succeeding length and so on to the end which enters an opening in the chimney at approximately a 12-inch elevation above the opening in the furnace. This arrangement imparts an awkward twist to the entire ensemble almost impossible to restore after the pipe has been taken apart.

"Without doubt the lad who installed the pipe had his own troubles, but he had the advantage of working with a cold pipe. True, the pipe was not red hot when I tackled it, due of course to the sluggish combustion, but believe me it was hot enough to make me think of the simile of the hot potato. I had to wrap my hands in old rags, a rare handicap to a man engaged in the ticklish job of fitting the end of one pipe over the end of another pipe, both apparently of the same identical diameter. At several stages of the performance, and in defiance of all the laws of nature, I was inclined to the opinion that the theoreticaly small ends of the pipes had expanded in some miraculous manner. In line with the same miraculous manifestation, the larger end of the adjoining pipe seemed to have shrunk. Also, and this was the most mysterious feature of all, the openings in the pipes assumed the most peculiar and grotesque outlines instead of true circles. The aggravating behavior of inanimate objects is beyond human comprehension.

"However, I did not discover these features until I entered upon the second stage of the performance. In the first I had to disconnect the pipe and take it down. How these sections clung to each other! Tighter than Damon and Pythias. David and Jonathan, or the proverbial drowning man and the straw. The entire ensemble also seemed to be set up with the deliberate view of preventing any person taking it apart, either by pulling one end away from the furnace, or by pulling the other end out of the chimney.

"Any man can acquit himself in a fairly satisfactory manner wrestling a pipe on the ground or even at a height of 2 or 3 feet. His efficiency is cut down at least 57.4806 per cent when he tackles the same pipe over his head."

"I don't know how you arrive at the exact figure," I said, "but offhand I should say you are approximately right. If any thing, your estimate is on the low side. I had a somewhat similar experience last winter."

"You had, eh?" Bill said. "Will then you will not be surprised to learn that when I finally pulled the pipes apart a bushel of soot fell out. All the soot did not fall on me for the simple reason that I did not expose enough area to receive it all. Believe me, kid, I got my share, scripture measure, full and running over.

"Finally I cleaned the pipes and then spent a strenuous half hour in setting them in place. Next time a job of that kind turns up I'll hire a lad with a particularly debased and wicked vocabulary. I anticipate a delightful half hour watching and listening to him.

"Before attaching the pipe to the furnace I noticed that the chamber surrounding the dome was partly filled with fine ash. Manifestly my job was only half done. That accumulation of ash had to be removed before the smoke could travel into the chimney. Also this deposit of ash materially cut down the effective heating area of the furnace. Willy-nilly had to remove the cap from the clean-out opening so that I could scrape out the dust.

"You have seen a molder draw a deep pattern by inserting a hook with an eye at one end into an eye in the draw strap on the pattern. I fashioned a similar tool from a piece of ¼-inch rod and then with a hammer and old file I finally removed the cap.

"Elated by this success I overlooked an exceedingly important item and that is that a constant current of air enters the bottom of the furnace and flows up into the distribution pipes and through the radiators into the various rooms of the house.

"The fine dust or ash that I pulled through the clean out door fell down inside the casing. It was immediately caught in the air current. Our old friend W. Shakespeare says hell hath no fury like a woman scorned. William lacked experience. He never saw a woman watching a cloud of fine ashes pouring out through every radiator in the house and settling on the curtains, furniture and carpets!"

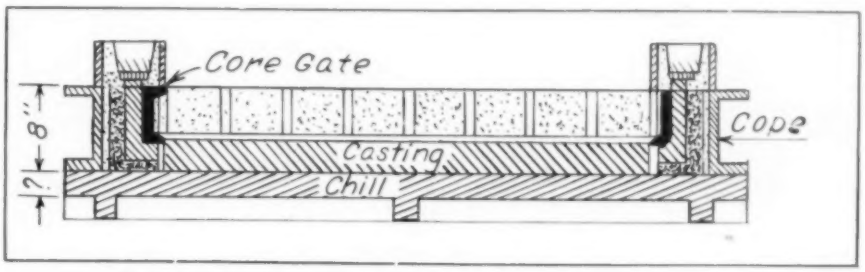
"Well," I asked. "Did you finish the job?"

"Boy," said Bill. "I never expect to hear the last of that story. If it is all the same to you, let us switch the conversation into pleasanted channels.

"I had a letter recently from a foundryman who enclosed a sketch of chilled wall and roof plates for the lining of a vault. He wrote that he would appreciate any information on the best method of handling this job in the foundry. The order ran into considerable tonnage. He wondered if a ¼-inch chill on the face would cause the castings to warp. He also wanted to know what is the cheapest iron mixture for satisfactory castings of this kind.

"I wrote him that even a comparatively high silicon iron will chill to a depth of ¼-inch when cast against a heavy chiller, therefore if the specifications will not permit a deeper chill he cannot use a cheap mixture, that is one made up almost entirely of scrap. Two factors regulate the depth of chill. One is the thickness of the chiller. The second is the silicon content of the iron in the casting. A servicable chiller for a casting 3 inches in thickness, that is a chiller to stand up for repeated use must be at least 4½ inches thick. To secure a chill ¼-inch deep on the face of a casting poured against this chiller, the iron mixture will conform to the following aproximate analysis: Silicon 1.50 per cent, sulphur 0.10 per cent, manganese 0.60 per cent, prosphorus 0.50 per cent. This type of chiller presents

(*Concluded on page* 56)



A chill for a casting 3 inches thick should be 4½ inches thick

Obituary

ROBERT M. HENDERSON, 46, vice president and manager, Walworth-Alabama Co., Attalla, Ala., died March 19 at Birmingham, Ala. Mr. Henderson was graduated from Cornell university and later became connected with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., as an electrical engineer. Later he was employed by the Alabama Power Co., and the National Pipe & Foundry Co., Attalla. He remained with the Walworth-Alabama Co. when that foundry was acquired.

Jacob H. Albig, founder, Monon-Yough Foundry & Machine Co., McKeesport, Pa., about 35 years ago and which he operated until 1926, died at Pittsburgh recently.

William Blunt, 62, secretary-treasurer, Holmes Foundry Co., Port Huron, Mich., and an internationally known electrical engineer, died Feb. 25 at Preston Springs, Ont.

Archibald Fairbairn, 45, founder, Conshohocken Foundry Co., Conshohocken, Pa., died March 20. He also was superintendent of the electric furnace department, Midvale Co., Philadelphia.

John McMyler, founder of the McMyler Mfg. Co., which later acquired the Interstate Engineering Co. and became known as the McMyler-Interstate Co., Bedford, O., died March 20 in St. Petersburg, Fla.

Walter E. Dean, 68, founder and president, Dean Brass Foundry, Atlanta, Ga., died March 2. Before founding his own company he was connected for many years with the Southern Agricultural Works.

D. A. Barkley, manager of sales of pig iron, coke and by-products, stone and sand, Bethlehem Steel Co., Bethlehem, Pa., died March 3. In 1912 Mr. Barkley became identified with the Lehigh Coke Co. and in 1917 went with the Bethlehem company.

Charles E. Eveleth, 57, vice president, General Electric Co., Schenectady, N. Y., died at his home March 25. Mr. Eveleth had been with the General Electric Co., since graduation from Worcester Polytechnic institute in 1899 and had been vice president of the company since April, 1927.

Charles F. Gessert, 75, retired consulting mechanical engineer, at Brooklyn, N. Y., died March 24. From 1890 to 1893 Mr. Gessert was New York manager for the American Radiator Co. He was a former vice president of the Revolving Door Co. and was connected in various capacities with the Air Reduction Co. until his retirement about 10 years ago.

William S. Shelow, 64, metallurgist, Semet-Solvay Co., Norwood, O., died at his home March 21. Mr. Shelow was born in Newport, Ky., and studied metallurgy in the East. He was employed for many years as metallurgist by the American Pig Iron Warrant Co., New York, and later became metallurgist for the Eaton-Rhodes Co. He was connected with the Semet-Solvay Co. for the past ten years.

Joseph E. Fischer, for many years identified with the malleable iron industry of Wisconsin, died in Beaver Dam, Wis., recently. Mr. Fischer was born in Berlin, Wis. Following 13 years of service as superintendent, Milwaukee Malleable Iron Co., Milwaukee, and four years as superintendent, Belle City Malleable Iron Co., Racine, Wis., he spent 13 years as superintendent of the Western Malleables, Inc., Beaver Dam.

Charles A. Young, 74, president, Young Brothers Co., Detroit, manufacturer of industrial ovens, died recently at Detroit. Mr. Young was born in Windsor, Ont., and went to Detroit when he was 24 years old as superintendent of the Detroit Sheet Metal & Brass Co. He retained that position until 1896 when he resigned to enter the business, which he headed until the time of his death, with his brother, George A. Young. He also was president of the Young Land Co. and director of the Norton Hotel Co.

Louis W. Schimmel, founder of the Detroit Gray Iron Foundry Co., and Detroit Alloy Steel Co., Detroit, died March 12 at Detroit. Mr. Schimmel was born in Detroit and was educated in the German-American seminary and a business college. He began his career as a parcel boy in a mercantile house and later became bookkeeper and salesman for William H. Elliott & Co. After ten years with the Eckhart & Becker Brewing Co., he organized the Tivoli Brewing Co. of which he became president in 1898. Mr. Schimmel was a director and chairman of the board of the Detroit Gray Iron Foundry Co.

The Adventures Of Bill

(*Concluded from page 55*)

certain advantages in that a considerble number can be laid down on the foundry floor—they must be level—and thus constitute a set of permanent drags. However, there is the expense of making them to be considered, particularly if the face has to be machined.

"An alternative method is to chill the face of the casting with a great number of small iron blocks instead of one large block. This will involve the use of a drag flask for each mold. If a set of new flasks has to be made for the purpose, the total expense might not compare favorably with the former method. If flasks already are in existence, the method probably will be found to be more economical. Where conditions are favorable the method presents several advantages:

1—Total weight of iron tied up in chillers will be reduced by approximately 60 per cent. Blocks 4 x 6 x 2 inches thick will serve.

2—A multiplicity of blocks will eliminate any danger of the chiller warping or cracking.

3—The blocks may be cast in open sand molds at practicaly no expense for pattern or molding labor.

4—A cheaper grade of iron may be used in the plate castings. A chiller 2 inches in thickness will impart a chill ¼-inch deep to a casting poured from a mixture conforming to the former analysis, with the exception that the silicon is 1.00 per cent.

"Castings made according to this method will present ridges on the surface, but these easily may be removed by grinding.

"Chemical analysis alone is not a sufficient guide in making up the mixture for chilled castings. Irons from different sources, although showing the same analysis, may not react alike on a chill. For that reason the foundryman engaged in the production of chilled castings relies principally on a physical test. An iron block the same thickness as the chill (this of course may be modified and the result estimated in proportion) forms one side of an open sand mold. A small quantity of iron is taken from the ladle and poured in this test mold. After it has set it is cooled in water and broken. The depth of chill is noted and the iron mixture is adjusted in accordance.

"The method shown for gating the castings is satisfactory provided a channel is formed to admit the iron through several gates instead of the single gate at each end indicated in the sketch. However, a better method would be to pour the casting through six ¾-inch pop gates spaced about 12 inches apart on top and fed from a long basin and a single ladle. Whichever method is adopted, provision should be made for flooding the chilled face as rapidly as possible.

Truck Carries Welding Equipment to Job

Linde Air Products Co., 30 E. 42nd street, New York, has introduced a new cylinder truck which, it is pointed out, increases the ease and convenience of moving welding and cutting outfits from place to place in the shop or yard. The truck consists of a frame of angle iron and a beveled steel plate for the cylinder platform. The truck is 48 inches high, 30 inches wide and weighs 80 pounds.

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American Malleable Cast Iron

By H. A. Schwartz

This book is the first complete treatise on "black hearth" malleable iron ever published.

It covers the history of the malleable industry—its development, modern methods of manufacture, metallurgical principles involved and the properties and uses of American malleable cast iron. It also includes a detailed bibliography in which all the important books and articles published pertaining to malleable iron are listed and represents the only reference work available on the subject.

While written primarily for the producer and user of malleable castings, this book is also adapted to the needs of the technical student and the library.

"American Malleable Cast Iron" is the only book on malleable iron in print.

Price, Postpaid: $7.15 in U. S. and Canada; 35s. 9d. in other countries.

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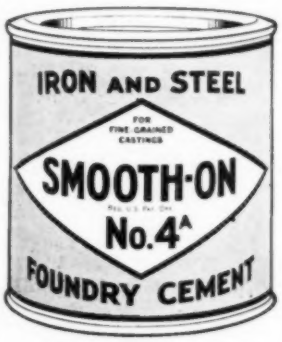

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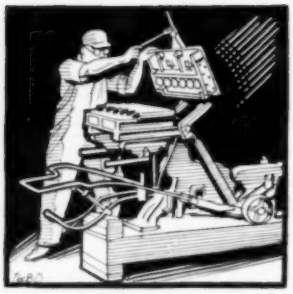
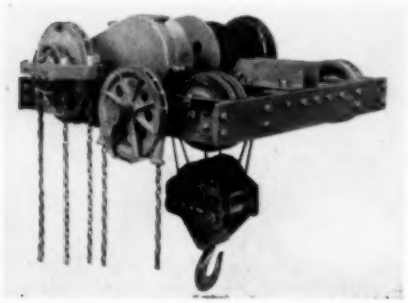
New Equipment



For Foundries

Drum Hoist Requires Low Headroom

Chisholm-Moore Hoist Corp., Tonawanda, N. Y., has introduced a new drum hoist which is a compact combination of the wire rope hoist and a geared structural carriage made by that company. The unit is designed for operation where headroom is limited and maximum lift is required. It is designed for use with a double I-beam, overhead, traveling crane. The hoisting unit is equipped



Capacities of the hoist range from 3 to 30 tons inclusive

with a dual chain sheave and two pendant hand chains. The larger sheave provides low speed ratio for capacity loads and the smaller sheave provides high speed ratio for light loads.

Capacities range from 3 to 30 tons inclusive. Disk type brake is used to provide the necessary load holding capacity and give perfect control at all times. Fourteen ball and roller bearings are included in the hoisting mechanism, which operates in a grease bath in an oil-tight housing.

Combine Motor And Speed Reducer

Motorized speed reducers of high efficiency, capable of employing nearly any type of motor, have been introduced by the Louis Allis Co., Milwaukee. The motor and speed reducer are combined into a single, compact, self-contained unit which provides an easily-mounted, slow-speed drive for many types of industrial machinery. Ratings available are ¾ to 75 horsepower with output speeds 4 to 400 revolutions per minute.

The units can be furnished with motor characteristics and style of mounting best suited to each application. The integral style in which the endbell is removed and the motor close-coupled to the gear casing, is common where an open motor or enclosed nonventilating motor is employed. The flexible style, in which the entire motor without any change is mounted on the gear casing, is supplied where conditions require an explosion-proof, enclosed fan-cooled, splash-proof, or other protected type of motor. Either style can be supplied to provide normal starting torque, high starting torque, high slip, adjustable speed, multispeed, or other characteristics that can be built into separate motors.

Welding Torch Has Wide Range of Work

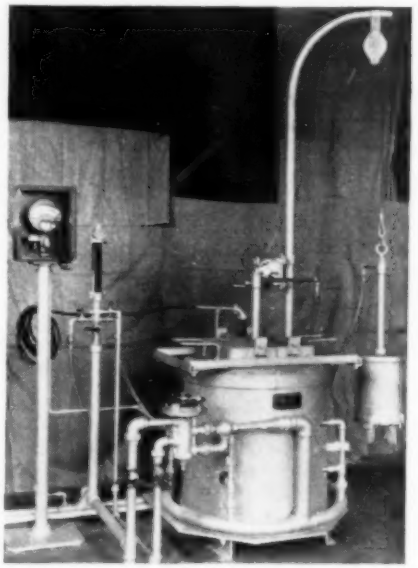
Linde Air Products Co., 30 East 42nd street, New York, has introduced a new welding torch to its line of oxyacetylene apparatus. Ten one-piece, 60-degree goose-neck tips, numbered from 6 to 15, are available for use with this torch. They are built with hard-drawn copper stock to withstand the intense reflected heat of the heaviest welding job. The tips may be adjusted to point in any direction with a union nut. Tips Nos. 6, 8, 10, 12 and 14 are supplied with the torch, giving a range from 16 gage sheet up to heavy castings. By using the cutting attachment with the torch, steel up to 2 inches in thickness may be cut with the equipment.

T. A. Marsh, for 10 years chief engineer, Green Engineering Co., 7 years western engineer, Combustion Engineering Corp., and for 3 years president, Modern Coal Burner Co., has become a partner in the Ernest E. Lee Co., Chicago, manufacturers' representative.

Furnace Used for Carburizing or Nitriding

American Gas Furnace Co., Elizabeth, N. J., recently has developed a bell-type retort furnace which is adapted to carburizing using a hydrocarbon gas, nitriding using ammonia gas, or bright annealing using a neutral or inert gas, as well as the customary operations.

In the case of carburizing, the



Radiation losses are low because the bell is enclosed

spent carburizing gases escape from the bottom of the bell and are consumed in the furnace, thus increasing the efficiency. Furthermore, radiation losses are low because the bell is enclosed entirely by the furnace.

Work can be cooled in the furnace if desired. Quenching direct from furnace temperature is accomplished either by removing the bell, allowing the work on the base to remain in the furnace for removal of the individual pieces and quenching, or as in the case of ring gears, a special yoke may be employed to elevate the base and work slowly so that the individual gears may be withdrawn and quenched in a jig, fixture, or quenching machine.

Tests Moisture Content of Molding Sand

A new type of apparatus to determine the moisture content of molding sand and other materials has been introduced by the Alpha-Lux Co., 192 Front street, New York. Principal parts of the equipment consist of a scale, a measuring scoop, a shaker and an absorbent material which is used in the test.

In operation, the molding sand to be tested is weighed on a scale, the same quantity of material being used in each test. The top of the shaker is removed and the weighed sample is placed in the container or shaker. A scoop filled with the absorbent material then is placed in the shaker while the latter is in a horizontal position so that the powder in the receptacle does not come in contact with the material to be tested before the top is screwed into position firmly. After closing, the container is shaken and the pressure created by a gas formed when the absorbent material comes in contact with the moisture in the sand creates a pressure which is indicated on a dial at the bottom of the shaker.

The scale can be folded and fits easily in a small compact case containing the remainder of the testing apparatus. The complete outfit weighs approximately 8 pounds.

Industrial Truck Has Steel Ram on Front

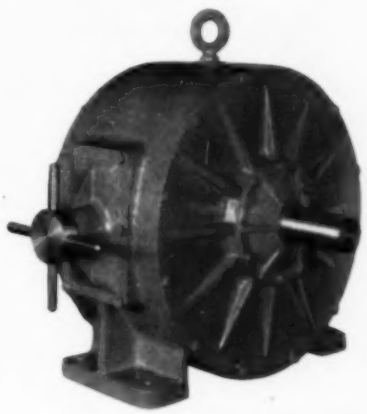
Clark Tructractor Co., Battle Creek, Mich., has introduced a new type of industrial truck designed for handling certain types of heavy, bulky materials and packages. The unit is built on a standard tiering, lift truck chassis. A steel ram on the front of the truck has a diameter of 3 inches and a standard length of 30 inches. It is anchored securely to the vertical plate and capable, in the 2-ton model, of carrying and tiering 4000 pounds if the center of the load is carried not more than 15 inches from the plate. The truck is also built in the 3-ton model. The unit, if gas powered for 24 hours continuous service, has a speed of from one to four miles an hour.

Fire Hose Is Flat

B. F. Goodrich Co., Akron, O., has introduced a new fire hose which is manufactured flat and becomes round when filled with water. It is pointed out that the new type of hose is easier to coil and rack as it does not bulge or buckle, occupies less space, reduces labor and handling, and is neater in appearance. The Goodrich company also states that the new hose has a greater life than round cured hose, since rubber always deteriorates faster under tension and round cured hose, when compressed in racking or coiling, places part of the rubber under strain.

Pumps Incorporate Balanced Pressure Design

Northern Pump Co., Minneapolis, recently introduced a line of hydraulic pumps and motors of the rotary radial piston type, available in sizes from 1 gallon per minute to 200 gallons per minute, and pressures of



Pumps are of the rotary radial piston type

4000 pounds per square inch, pumping oil for hydraulic systems. Volume of discharge can be changed to deliver any amount from zero to the maximum capacity of the pump, and discharge can be reversed without stopping the pump or changing speed of rotation.

All pumps are fitted throughout with nitralloy and incorporate a balanced pressure design to prevent heavy bearing loads at high pressures. A complete line of automatic controls and semiautomatic valve mechanisms is available for use with the pumps.

Chain Resists Corrosion

Link-Belt Co., 910 South Michigan avenue, Chicago, has introduced a new roller chain which has side bars of alloy rolled steel, heat treated for strength and toughness, and specially treated to resist corrosion. The chain is made in all sizes from ⅜ to 2½-inch pitch and in single or multiple widths. It is available with wheels of any horsepower, also with conveying attachment links in wide variety. Uniformity and close clearance throughout are features of design.

Gear Unit Designed For Relative Low Ratios

Falk Corp., Milwaukee, recently has introduced a combination motor and gear unit, especially designed for relatively low ratios, both speed reduction and speed increase. The geared-head differs from other types manufactured by that company in that the motor frame supports the gearing, the gear housing being rigidly connected to and supported from the stator. The take-off shaft generally is located directly above and in line with the center of the motor, but the design is such that it can be positioned to either side or below, where desired. A solid roller type bearing is used for mounting the pinion end of the motor, the roller assembly being carried with the outer bearing race.

The head is proportioned to carry as much oil as possible so as to require replacement or addition at only infrequent intervals. The pinion shaft has two slingers which carry the oil up so that the teeth of the gear may bring it into the mesh point. Special attention is given to preventing the oil from coming in contact with the winding at the high speed pinion.

Photoelectric Relay Has New Features

A general purpose, photoelectric relay, with several new and important features has been developed by the General Electric Co., Schenectady, N. Y. This relay provides more sensitive control than the models which it supersedes and at the same time will permit operation at a minimum light intensity of three foot-candles. Other features offered by the new relay include improved dielectric strength through the use of a bakelite panel, an improved phototube housing with a cast aluminum base and a drawn aluminum hood, reduced capacity leakage due to the use of flexible armored cable between the phototube and the relay proper, thus affording better operation in damp atmospheres. The relay uses a pliotron tube.

Develops Alloy

Driver-Harris Co., Harrison, N. J., recently has developed a new series of nickel-chromium alloys to be known as Nichrome V.

A. S. Kennedy recently has been appointed manager of the Kansas City branch office of the Chain Belt Co., Milwaukee. For the past 5 years Mr. Kennedy has been a sales engineer covering the states of Missouri, Kansas and Nebraska.

TWO IMPORTANT EVENTS—

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JUNE 20 21 22 23 ●

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JUNE ●

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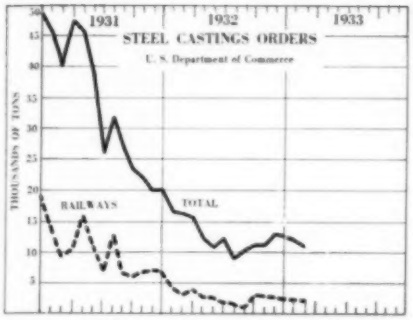
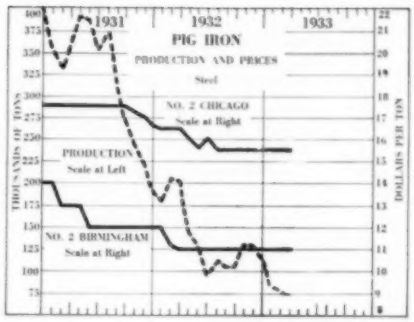
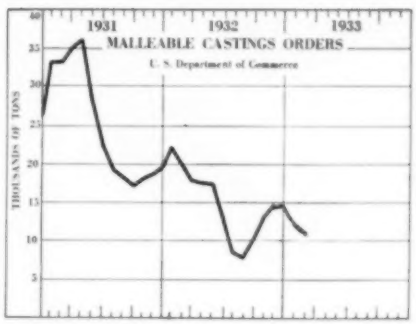
POST-CONVENTION ISSUE

JULY ●

The July (Post-Convention) issue of The Foundry will constitute a permanent record of what happened at the Foundry convention and will also carry a detailed account of "Industrial Week" at the Century of Progress. The July issue of The Foundry will be often referred to and many thousands of foundrymen will read your advertisement. Copy may reach us as late as July first.







Foundry Activities

Reflect Industrial Trends

FLOUR CITY ORNAMENTAL IRON CO., 27th avenue and 27th street, Minneapolis, has acquired the business assets formerly held by the General Bronze Corp., New York, and again is being operated as the Flour City Ornamental Iron Co. The latter company was organized by Eugene Tetzlaff 40 years ago to manufacture ornamental iron and bronze and other artistic metal work, and now is operating one of the largest plants specializing in that line of product. The managing officers are the same as before the company was merged with the General Bronze Corp,. and are as follows: President, Eugene Tetzlaff; vice presidents, H. C. Baldry and Walter Tetzlaff; secretary and treasurer, Henry J. Neils. These officers with Ernest Rubbert, master mechanic, constitute the board of directors.

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Christian Garschke, 2725 South Austin street, Milwaukee, has established a brass and aluminum foundry at 828 South Water street.

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Crescent Foundry Co., 1210 Johnson street, Amarillo, Tex., will take bids soon on a 2-story foundry plant, 60 x 80 feet, with equipment.

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Adams Co., Dubuque, Ia., is observing its fiftieth anniversary. Eugene Adams is president and Herbert Adams secretary-treasurer.

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Florence Pipe Foundry & Machine Co., Florence, N. J., recently started operations at its centrifugal pipe shop after being shut down for several weeks.

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Harry F. Brown Inc., Philadelphia, has been incorporated with $5000 capital to manufacture patterns for castings and models, by Harry F. Brown, 409 Jericho road, Abington, Pa.

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Doehler Die Casting Co., Smead avenue, Toledo, O., plans alterations and readjustments in its plant to accommodate concentration of manufacturing operations from other plants.

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Reorganization of the National Radiator Corp., Johnstown, Pa., has been approved by the United States court of appeals. The plan provides the acquisition of the property by a reorganization committee.

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Sioux City Foundry & Boiler Co., Sioux City, Iowa, has been capitalized at $100,000. Herman Galinsky is president, A. L. Galinsky secretary, and J. Kalin vice president and treasurer.

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Ferror Foundry & Mfg. Co., Easton, Pa., has purchased the plant of the former Wilson Foundry Co. Alterations are being made and new equipment added preparatory to production of plow parts, road machinery and equipment.

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Baker-Nagie Co., Belleville, Ill., will reopen its stove and furnace foundry within a short time and may employ upwards of 500 men in the several departments. The receivership begun Aug. 17 has been terminated. Permitting the reopening.

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Sparta Foundry Co., Sparta, Mich., reports only a 3 per cent decrease in business during 1932. Officers recently were elected as follows: Chairman, A. A. Johnson; president, T. E. McFall; vice presidents, John Schuitema, H. G. Vaughan, D. W. Atkinson and I. E. McGowan. Mrs. Lou Keller was elected secretary-treasurer.

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Main building of the South Side Malleable Casting Co., 2700 South Nineteenth street, Milwaukee, was burned recently. The building, 450 feet long, was wrecked and equipment severely damaged. The plant was idle. Rebuilding has not been decided on, pending insurance adjustment. Walter W. Lange is president and general manager.

RAW MATERIAL PRICES
April 4, 1933

Iron	
No. 2 foundry, Valley	$14.50
No. 2 Southern, Birmingham	11.00
No. 2 foundry, Chicago	15.50
No. 2 foundry, Buffalo	16.00
Basic, Buffalo	15.50 to 16.00
Basic, Valley	14.00
Malleable, Chicago	15.50
Malleable, Buffalo	16.50
Coke	
Connellsville beehive coke	$3.50 to 4.00
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$9.00 to 9.50
Heavy melting steel, Pitts	9.00 to 9.50
Heavy melting steel, Chicago	5.00 to 5.50
Stove plate, Buffalo	7.00 to 7.25
Stove plate, Chicago	5.00 to 5.50
No. 1 cast, New York	4.50 to 5.00
No. 1 cast, Chicago	6.50 to 7.00
No. 1 cast, Pittsburgh	9.00 to 9.50
No. 1 cast, Philadelphia	9.00 to 9.50
No. 1 cast, Birmingham	7.00 to 8.00
Car wheels, iron, Pittsburgh	7.75 to 8.25
Car wheels, iron, Chicago	8.25 to 8.75
Railroad malleable, Chicago	6.50 to 7.00
Agricultural mal., Chicago	5.00 to 5.50
Malleable, Buffalo	8.00 to 8.50
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	4.75
Straits tin	25.00
Aluminum, No. 12, producers	17.00 to 22.00
Aluminum, No. 12 remelt Cleveland	8.00 to 9.00
Lead, New York	3.00
Antimony, New York	5.80 to 5.85
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.00

New Trade Publications

TITANIUM—The Titanium Alloy Mfg. Co., Niagara Falls, N. Y., is issuing a monthly reminder with which is included technical comments and data on the metallurgical properties and uses of titanium.

HOSE FITTINGS—Dallett Co., 165-189 W. Clearfield street, Philadelphia, has published several bulletins describing its line of hose fittings, including couplings, hose ends, pipe ends, clamps, stopcocks, etc.

MODERNIZATION—General Electric Co., Schenectady, N. Y., has published a bulletin entitled "Modernization Pays," which discusses the need for replacement of obsolete machines and methods in industry.

STEEL CASTINGS—"Buying Steel Castings" is the subject of a bulletin recently published by the Detroit Steel Casting Co., Detroit. Nine reasons for buying carbon or alloy steel castings from that company are listed in the bulletin.

BLOWERS — Roots-Connersville-Wilbraham, Connersville, Ind., has published a bulletin describing a small type direct coupled blower and motor. Another bulletin by the same company discusses a blower for handling gases and vapors.

MECHANICAL RUBBER GOODS—Diamond Rubber Co. Inc., Akron, O., has published a catalog on its line of mechanical rubber goods, including such items as transmission belts, conveyor belts, elevator belts, rubber hose, fittings, packing, respirators, etc.

ELECTRIC HEATING—A folder of the Westinghouse Electric Supply Co., 1430 West Ninth street, Cleveland, describes space heaters, steel clad heaters, cartridge heaters, and oil immersion heaters. Specifications for these various units are included.

PORTABLE TESTING MACHINE—Linde Air Products Co., 30 East 42nd street, New York, has published a booklet describing portable tensile testing machines which may be used in testing welds. Details of construction and complete directions for operation are contained in the booklet.

TUMBLING STARS—W. W. Sly Mfg. Co., 4700 Train avenue, Cleveland, has published a bulletin on its hard, sharp, white iron tumbling stars. Advantages in the use of the stars are indicated and mill capacities are given. Information also is presented on its roller bearing tumbling mills.

MAGNESIUM ALLOYS — Various types of sand castings and die castings of magnesium are illustrated in several recent bulletins published by the Dow Chemical Co., Midland, Mich. Parts shown include portable tools, vacuum cleaner parts, engines, airplane parts, bus seats, etc.

STOKERS—A standard type of underfeed stoker designed to fit the needs of medium size buildings is described and illustrated in a recent bulletin of the Patterson Foundry & Machine Co., East Liverpool, O. The stoker is built in a wide range of sizes through the use of standard unit parts to fit individual dimensional requirements.

PORTABLE CRANE—Bucyrus-Erie Co., South Milwaukee, Wis., has published a 20-page bulletin devoted chiefly to illustrating a general utility crane mounted on a tractor which recently has been introduced by the company. Several photographs illustrate uses of the crane in foundries. Capacities and working ranges as well as specifications are included.

DUST COLLECTORS — Pangborn Corp., Hagerstown, Md., has published a bulletin discussing briefly the application of its equipment to the field of dust control. A second bulletin describes and illustrates a new blast helmet which is designed to supply clean, deodorized, water washed air continuously to the operator of the sandblast equipment.

CAST IRON DATA—A guide to the selection of engineering specifications for gray cast iron to secure density, hardness, toughness, wear resistance, strength, rigidity, machinability, and reduction of chill, recently has been published by the International Nickel Co., Inc., 67 Wall street, New York. Data indicates compositions to secure specified properties.

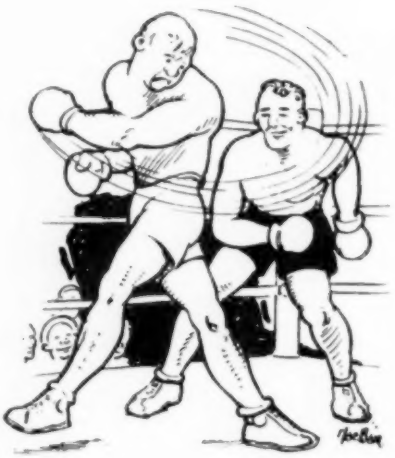
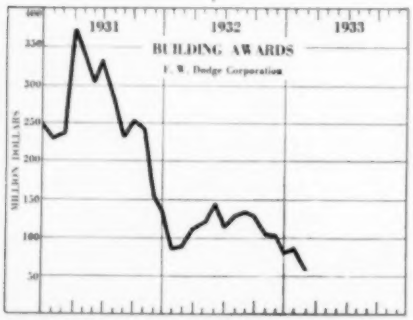
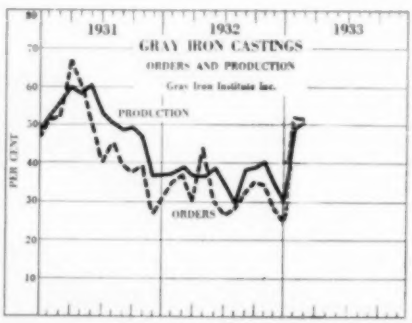
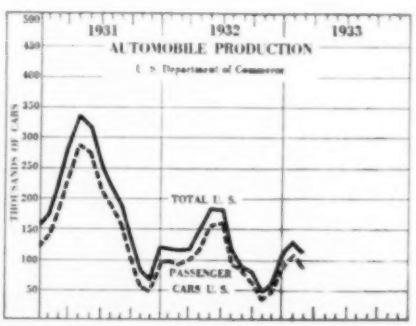
SYNCHRONOUS MOTORS — The complete line of synchronous motors produced by the General Electric Co. Schenectady, N. Y. is discussed in a recent 52-page catalog. The text discusses the economies of the synchronous motor, high speed synchronous motors, low speed synchronous motors, and special types of motors and synchronous motor generators.

CORE BLOWING MACHINES—The Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, has published a bulletin on its line of core blowing machines and a special core box drawing machine for complicated and heavy cores. Examples of complicated cores are reproduced and information is given on the increased production resulting from the use of the core blowing machine.

DIE CASTINGS—New Jersey Zinc Co., 160 Front street, New York, has published a booklet on the use of zinc for die castings. Information includes a discussion of the effect of aging treatment on the tensile strength of the alloys, on the impact strength, and the dimensions of the alloys. The booklet is well illustrated with reproductions of photographs of various types of die castings made from zinc alloys.

SAFETY—"Methods of Organizing and Conducting Industrial Safety Contests," recently published by the Policyholders Service bureau, Metropolitan Life Insurance Co., 1 Madison avenue, New York, presents practices of a number of industrial organizations in stimulating the interest of the employes in plant safety activities and encouraging them to make concentrated efforts to prevent accidents. Safety competitions, according to the study, are considered of particular value in that they act as incentives to employes after the novelty of launching a safety program has dulled.

Faked Foundry Facts



An Air Hammer